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ABSTRACT

This unit weighs the choices and tradeoffs involved in protecting the environment. The first section of the first booklet is designed to introduce students to the most significant global environmental problems. Part 2 explores humanity's impact on the environment while part 3 examines environmental issues from the political dimension as a challenge to the planet. Students research and debate four policy options available to the United States including: (1) "Putting the Economy First"; (2) "Taking the Lead"; (3) "Sharing Environmental Leadership"; and (4) "Global Stewardship." The first booklet also includes the principles adopted by the "Rio Declaration on Environment and Development" (1992) and a 10-item reading list. The Teacher's Resource Book contains a day-by-day lesson plan and student activities (5 days). In addition, there is an optional science lesson that examines humanity's impact on the global carbon cycle. An alternative 3-day lesson plan may also by useful. (EH)

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CHOICES FOR THE 21st CENTURY

Global Environmental Problems: Implications For U.S. Policy

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ALTERNATIVES FOR PUBLIC DEBATE
AND POLICY DEVELOPMENT

A program of the Thomas J. Watson Jr.
Institute for International Studies

Brown University, Box 1948, Providence, RI 02912

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The Choices for the 21st Century Education Project develops curricula for high schools and colleges on current foreign policy issues and offers workshops, institutes, and in-service programs for high school teachers. Course materials place special emphasis on the importance of educating students in their participatory role as citizens.

The Choices for the 21st Century Education Project is a program of the **Thomas J. Watson Jr. Institute for International Studies** at Brown University.

Thomas J. Biersteker
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The Choices for the 21st Century Education Project is a program of the Thomas J. Watson Jr. Institute for International Studies at Brown University. Choices was established to help citizens think constructively about foreign policy issues, to improve participatory citizenship skills, and to encourage public judgment on policy priorities.

The Thomas J. Watson Jr. Institute for International Studies was established at Brown University in 1986 to serve as a forum for students, faculty, visiting scholars, and policy practitioners, who are committed to studying global problems and developing international initiatives to benefit society.

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Part I: Global Environmental Problems

Our Planet's Environment

A bustling steel mill in South Korea. Farmland newly cleared from the jungle in Brazil. A computer assembly plant in the United States. Together, these images illustrate the technological progress that characterizes the modern world.

But look again. The advances that have brought new prosperity to much of the globe have come at a price. The smokestacks of the steel mill spew out pollutants that spread to other countries. The farm has been carved out of a rainforest that had served as a home for thousands of rare plants and animals. The computer plant relies on chemical cleaning agents that threaten the earth's marine life.

In making use of the earth's resources, humanity has assumed a greater and greater role in shaping the planet's environment. We have also come to recognize that the continued expansion of human activity has spawned a new set of problems that extends beyond national borders.

In this unit, you will weigh the choices and trade-offs involved in protecting the environment. The first section of the background reading has been designed to introduce you to the most significant global environmental problems, while Part II and Part III explore the economic and political dimensions of the environmental challenges facing our planet.

Global warming

Much of the current anxiety regarding environmental problems revolves around "global warming." Scientists believe that global warming is resulting from man-made changes in the atmosphere over the last 200 years. They have linked the process to the build-up of carbon dioxide, methane, nitrous oxide, chlorofluorocarbons (CFCs), and other gases. These gases, which make up only a small percentage of the atmosphere, are called "greenhouse" gases because they trap heat in the atmosphere in much the same way that a greenhouse prevents heat from escaping beyond its glass panels.

Carbon dioxide accounts for 60 percent of the greenhouse gas build-up attributable to human activity. Carbon dioxide is essential for life on earth. Plants require it just as animals need oxygen. Moreover, carbon dioxide absorbs much of the earth's infrared (long-wave) energy that would otherwise be radiated back into space. By absorbing heat, carbon dioxide keeps the earth warm enough to support life.

Humanity, however, has added carbon dioxide to the atmosphere by burning fossil fuels such as oil, coal, and natural gas. Fossil fuels were formed from plants and animals that lived millions of years ago. In ages past, this organic matter accumulated under the earth's crust and was transformed by intense heat and pressure. Since the start of the Industrial Revolution in the late 18th century, the use of fossil fuels has soared and the amount of carbon dioxide in the atmosphere has increased by almost 25 percent.

An international panel of 2,500 scientists assembled by the United Nations (UN) concluded in 1995 that industrialization had most likely caused an increase of average global surface temperatures by nearly 1 degree Fahrenheit in the last century. The panel predicted that temperatures would rise between 1.8 and 6.3 degrees by 2100 unless greenhouse gas emissions are curbed. If the projections prove correct, people in the next century would have to cope with more heat waves, floods, droughts, and fires. Global warming would make desert climates more extreme and wipe out vast swaths of forest.

Moreover, the UN panel forecasts that global warming over the next century would raise the level of the world's seas by about 20 inches as the polar icecaps melt. Nearly 20 percent of the world's population, as well as many of the planet's most fragile ecosystems, could be vulnerable to coastal flooding.

Scientists acknowledge that they have much to learn about the factors affecting the global climate, and that the computer models they use to predict future global temperatures need refinement. Some

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Note: For more information about the role of carbon dioxide in the environment, see "Optional Reading: Following the Path of the Carbon Cycle" on pages 26-30.

believe that the increase in temperatures in recent years may be part of a natural cycle of climate change. At the same time, science offers hope that humanity may be able to adapt to a changing climate with new plant varieties, higher sea walls, and other measures.

Ozone depletion

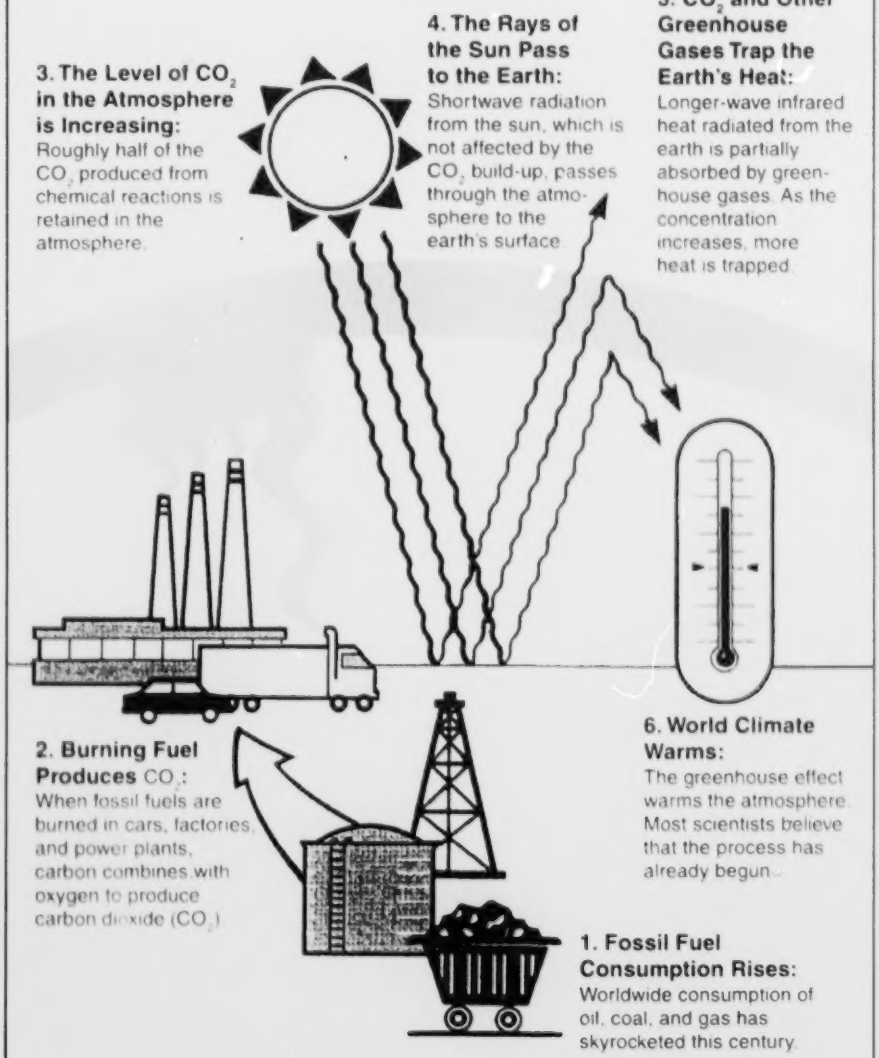
Since the 1970s, scientists have known that certain chemicals damage the ozone layer — the atmospheric shield ten to twenty-five miles above the earth that prevents much of the sun's damaging ultraviolet (UV) radiation from reaching the surface of the planet. (In contrast, ozone in the lower atmosphere is a polluting greenhouse gas.)

In 1985, scientists discovered a hole in the ozone layer over Antarctica the size of the continental United States. The climate over the South Pole in the spring creates conditions that promote ozone destruction. Later in the year, the air from the Antarctic ozone hole drifts northward and contributes to a thinning of the global ozone layer.

By 1995, the area covered by the hole had more than doubled. Equally alarming, scientists have found a smaller hole in the ozone layer over the North Pole, leaving people in Canada and the northernmost areas of United States and Eurasia vulnerable to increased ultraviolet radiation. Recent data indicate that ozone concentrations in the stratosphere have fallen to record low levels over much of the planet.

Chemicals containing chlorine and bromine have been linked to the destruction of the ozone layer. When these chemicals are released into the atmosphere, they slowly rise into the stratosphere and eat away at the ozone layer for about 100 years. Of the chlorine-producing chemicals, CFCs have the greatest impact. They have been used in refrigeration, air conditioners, aerosols, upholstery, foam insulation, and packing materials. (They also contribute to global warming.) When CFCs

The Greenhouse Effect: Changing the World's Climate


3. The Level of CO_2 in the Atmosphere is Increasing: Roughly half of the CO_2 produced from chemical reactions is retained in the atmosphere.
4. The Rays of the Sun Pass to the Earth: Shortwave radiation from the sun, which is not affected by the CO_2 build-up, passes through the atmosphere to the earth's surface.
5. CO_2 and Other Greenhouse Gases Trap the Earth's Heat: Longer-wave infrared heat radiated from the earth is partially absorbed by greenhouse gases. As the concentration increases, more heat is trapped.
2. Burning Fuel Produces CO_2: When fossil fuels are burned in cars, factories, and power plants, carbon combines with oxygen to produce carbon dioxide (CO_2).
6. World Climate Warms: The greenhouse effect warms the atmosphere. Most scientists believe that the process has already begun.
1. Fossil Fuel Consumption Rises: Worldwide consumption of oil, coal, and gas has skyrocketed this century.

This illustration of the greenhouse effect starts with number 1. (Reprinted with permission of the Public Agenda Foundation. Phil Scheuer, graphic artist.)

were invented in 1928, they were hailed as a safe alternative to ammonia and other dangerous coolants used in refrigerators. No one imagined that the same chemicals posed an environmental threat.

The world's wealthy, developed countries agreed to stop producing CFCs at the end of 1995. Nonetheless, eliminating CFCs from existing equipment, such as air conditioners and refrigerators, could take decades. Moreover, other ozone-depleting chemicals are still being manufactured. Methyl bromide, a chemical used to fumigate farmland, will not be phased out in developed countries until 2010. Production of hydrochlorofluorocarbons (HCFCs), a substitute for CFCs containing less ozone-depleting chlorine, will not be banned in the developed world until 2020. Scientists expect that the ozone layer will continue to erode well into the 21st century.

Ozone depletion could have serious consequences for human health, plants, and sea life. Greater exposure to UV radiation would result in increased rates of skin cancer, cataracts, and immune system problems. Scientists predict that additional UV radiation would also reduce crop yields and harm phytoplankton, the first link in the aquatic food chain.

Acid rain

In recent decades, scientists have come to understand that air pollution not only affects human health, but damages the natural environment as well. Particular attention has been paid to acid rain.

Acid rain results from the pollutants emitted by the burning of fossil fuels, especially coal. The leading agents of acid rain — sulfur oxides and nitrogen oxides — are released by smokestacks, smelting plants, and automobiles. Once in the atmosphere, these pollutants are converted to acid, then return to the earth's surface in the form of rain, snow, or fog, often hundreds of miles from their source.

Acid rain has damaged the ecosystems of lakes and rivers in many industrialized countries. Scandinavia has been particularly hard hit by the pollution of both Britain and central Europe. An estimated 16,000 lakes in Sweden have been severely harmed by acid rain. In Canada, more than 150,000 lakes have been similarly affected. Scientists have determined that acid rain takes a heavy toll on forests as well. Excess acids leach nutrients from forest soils and impair the ability of trees to use the remaining nutrients. The ill effects often show up in the form of discolored leaves and needles.

Acid rain has emerged as a controversial international problem among industrialized nations. Germans, who decry the destruction of much of their famous Black Forest, claim that more than half of their acid rain originates elsewhere. Likewise, Canadians point out that the amount of acid rain they receive from the United States is up to four times more than the amount that the United States receives from Canada. Recently, the two neighbors agreed to stricter measures to reduce sulfur oxide emissions.

Greater concern about acid rain has led many industrialized countries to control sulfur oxide pollution by promoting the use of scrubbers in coal plants and other new technologies. In the poor, developing world, however, increased industrialization and automobile use threatens to extend the problem of acid rain to even more areas of the globe.

Deforestation and desertification

Since ancient times, people have cleared trees for agriculture and shelter. The great civilizations of the Mediterranean world devastated the woodlands of the region. The forests of Britain are one-tenth of the size of the forests that existed there 3,000 years ago.

While forests have actually expanded somewhat in Europe and North America over the past century, the problem of deforestation has worsened in many developing countries. In areas where rainfall is scarce — amounting to one-third of the earth's land — the clearing of forests often leads to the spread of desert.

These two processes — deforestation and desertification — are closely linked. The root structure of trees holds soil in place and provides nutrients for ground cover. Conversely, chopping down trees leaves soil exposed to the full force of rain and wind. Poor farming practices and short-sighted irrigation methods worsen soil erosion. Livestock further harms the land by eating young plants and leaving behind hard-packed trails and gullies.

Every year, approximately 70,000 square miles

Land Degradation Caused by Human Activity, 1945-1991

(figures in millions of hectares)

Region	Overgrazing	Defores-tation	Poor farming practices	Other	Total	Percentage of degraded land
Asia	197	298	204	47	746	20%
South America	68	100	64	12	244	14%
Europe	50	84	64	22	220	23%
North America	38	18	91	11	158	8%
Africa	243	67	121	63	494	22%

Data from *State of the World 1994*

of land are taken out of agricultural production, at least temporarily, because of desertification. In the 1930s, grasslands in the American Great Plains that had been plowed up during the previous decade were turned into a dust bowl by drought. Regular rainfall and more careful farming practices eventually helped restore the productivity of much of the area. Today, agricultural land is being lost to desert primarily in Africa, where 26 percent of the continent is undergoing some form of desertification.

Tropical forests are particularly vulnerable to desertification. In Brazil, which contains 26 percent of the world's tropical forests, trees have been cleared in the Amazon River basin for cattle ranching, logging, and agriculture. Without a protective canopy of dense vegetation, tropical soils are unable to withstand the impact of heavy rains and the equatorial sun. Since tropical forests absorb much of the atmosphere's carbon dioxide and release large amounts of carbon dioxide when burned, their loss could speed up the pace of global warming.

Decline of biodiversity

As humanity has moved into areas that were once wilderness, the extinction of plants and animals has increased rapidly. Some biologists predict that the earth may lose one-fifth of its existing species in the next twenty years. Any loss of biodiversity — the range of life on the planet — is beyond human power to replace. Potential sources for new medicines and technologies are also lost.

Concern for preserving biodiversity centers on areas that are rich in wildlife, such as tropical rainforests. Although they cover only 6 percent of the earth's land, tropical rainforests contain over half the world's land-dwelling species. These areas have been stripped of their trees at an accelerating rate. Every year, more than 40 million acres of tropical rainforest — an area the size of Washington state — are lost, and with them 4,000 to 6,000 tropical species. Other species-rich habitats are also endangered. Coastal wetlands have been damaged by development, while overfishing has nearly exhausted many of the ocean's most prized fishing grounds.

Beginning in the 1970s, the United States and other developed countries took the lead in adopting laws to protect endangered species. The Alaska National Interest Lands Conservation Act of 1980 set aside an area larger than California to preserve Arctic habitat. Wildlife preservation, however, has sparked protest from industries, such as timber and energy, that are barred from protected areas.

Many developing countries, such as Kenya and Zimbabwe in Africa, have attempted to protect wildlife by expanding their parks and preserves, particularly in areas that contain animals popular with tourists. The celebrated work of Jane Goodall, Dian Fossey, and other scientists on African primates has resulted in stricter laws to protect the habitat of chimpanzees and mountain gorillas. In most of Africa and other poor regions, however, governments lack the funds to combat well-organized poaching operations.

Part II: Humanity's Impact on the Environment

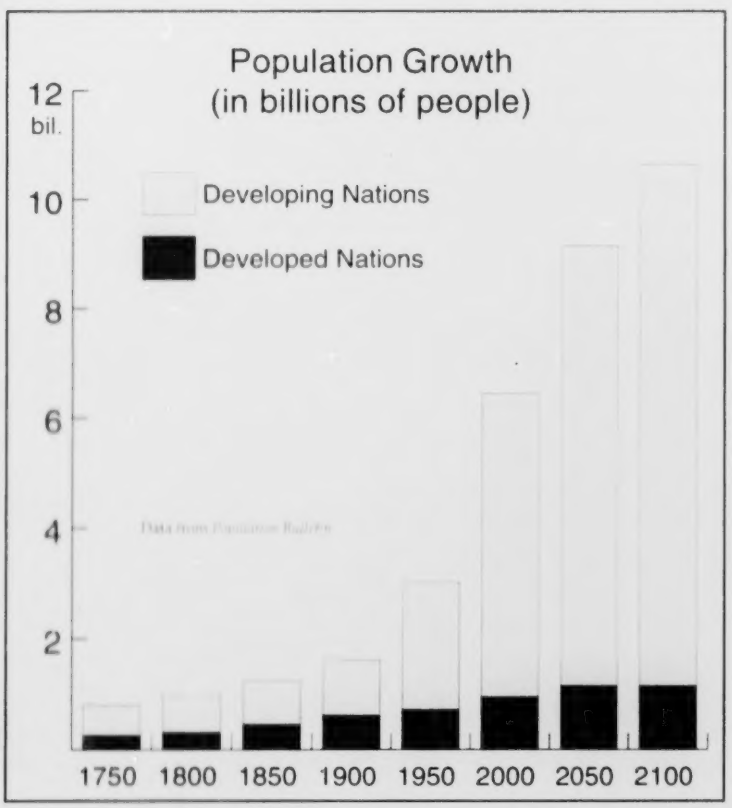
The development of agriculture 5,000 to 8,000 years ago set the stage for a gradual increase in human population. In ancient times, it took 2,000 years to double the number of people on earth. Since 1900, though, world population has more than tripled.

Europe's population grew rapidly in the 18th and 19th centuries, while population growth in much of Asia, Africa, and Latin America has accelerated during the 20th century. Improvements in sanitation and medicine have all contributed to the decline in death rates. At the same time, new agricultural techniques have enabled many countries to significantly increase their food production.

Our planet is now home to more than 5.7 billion people, with population growing at the rate of 86 million a year. Almost 95 percent of population growth is occurring in developing countries. Population figures alone, however, are only part of the story. Equally important are consumption patterns. Although there is little population growth in the developed world, the roughly 1 billion people who live there use a much greater proportion of the world's resources than their counterparts in developing countries. For example, an American uses 36 times more commercial energy (energy that is produced and sold) than does an Indian.

Understanding the division between the wealthy, developed world and the poor, developing world is critical to the discussion of global environmental problems.

For the world's developed countries, such as the United States, Japan, and the nations of Western Europe, industrialization has raised living standards to levels previously unknown in human history. For many developing countries, industrialization has become a goal. Billions of people in the developing world hope one day to have the lifestyle Americans enjoy. Scientists fear, however, that if the developing world follows the pattern of industrialization pursued by wealthy nations over the past two centuries, the earth will be unable to support the increased level of consumption.



Energy and the Environment

Energy is at the crux of the modern dilemma. With the onset of industrialization in the late 1700s, England was the first country to replace wood with fossil fuels as the main source of energy. Forests were cleared and coal was increasingly used to meet England's ever-growing appetite for energy. In the 1800s, coal mining was expanded and oil-drilling techniques were developed. By the turn of the century, the United States had taken the lead in forging an industrial economy powered by coal and oil. Today, these two fossil fuels, along with natural gas, supply nearly 90 percent of the world's energy.

Fossil fuel conservation

Fossil fuel use has held steady in the developed world over the past two decades. Energy conservation has been the key factor. The major turning point came in 1973, when

oil-producing Arab states cut off oil shipments to the United States to protest U.S. military aid to Israel. The embargo convinced the oil producers that higher prices could be maintained if they limited production. During the 1970s, the strategy worked. Oil prices soared from as low as $1 a barrel at the beginning of the decade to over $30 a barrel by 1979. Prices for other fossil fuels also increased.

In the United States and other developed countries, higher energy prices spurred new conservation measures in the 1970s. President Richard Nixon lowered the national speed limit to 55 miles an hour, consumers bought cars with better gas mileage, and industries improved fuel efficiency. Conservation efforts were accepted much as they had been during World War I and World War II.

Since the fall of energy prices in the mid-1980s, however, progress on conservation has slowed. Gasoline prices in 1996 were comparable to prices before 1973. Americans are driving more and buying less fuel-efficient cars. Compared to Americans, the Japanese and British use half as much energy per person.

On a global scale, the largest increases in fossil fuel consumption are occurring in rapidly industrializing countries. By 2020, the developing world as a whole (not including the former Soviet bloc) is expected to consume 40 percent of the world's fossil fuels, up from the current level of 28 percent.

Worldwide emissions of greenhouse gases could be reduced by substituting natural gas for oil and coal. Although natural gas is a fossil fuel, it produces much less pollution than do oil or coal. Natural gas currently provides one-fifth of the world's commercial energy. Most energy analysts, however, concede that oil will continue to power virtually all of the world's more than 600 million vehicles well into the future.

Alternatives to fossil fuels

Renewable energy offers a solution to global warming, but raises other problems. Nuclear power

Glossary of Environmental Terms

Greenhouse gases: Gases — such as carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons — that keep the earth's heat from escaping through the atmosphere.

Carbon dioxide (CO_2): A greenhouse gas which helps maintain the warmth of the planet by trapping infrared radiation. Since the Industrial Revolution, the amount of CO_2 in the atmosphere has increased by 25 percent.

Fossil fuels: Oil, coal, and natural gas that were formed from plants and animals that lived millions of years ago. Fossil fuels supply about 90 percent of the world's energy.

Ozone layer: A shield of ozone (O_3) molecules 10-25 miles above the earth that blocks much of the sun's harmful ultraviolet radiation.

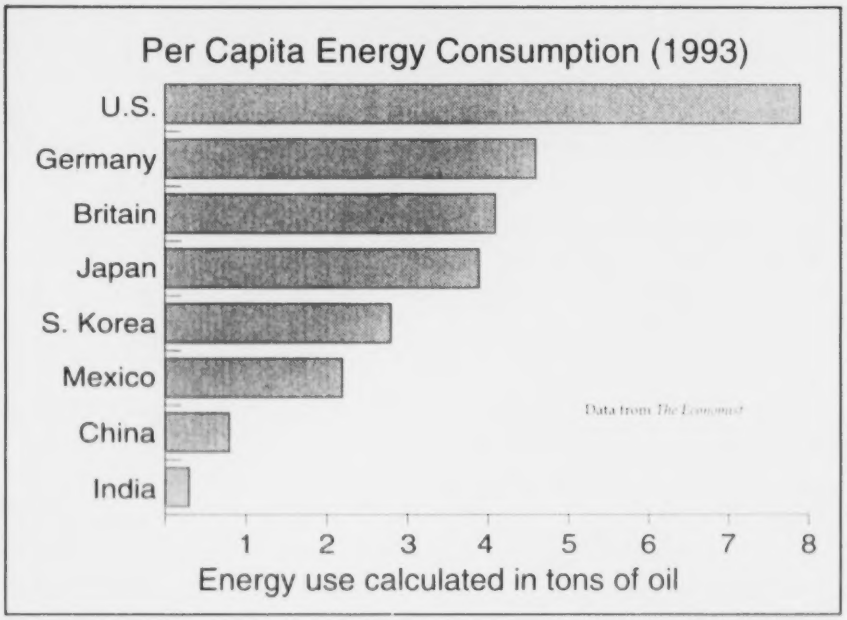
Chlorofluorocarbons (CFCs): Man-made chemical compounds used in refrigeration, insulation, foams, and a number of industrial processes. When CFCs reach the stratosphere, they release chlorine atoms that damage the ozone layer.

Sulfur oxides (SO_x) and nitrogen oxides (NO_x): The leading agents of acid rain. They are released through the burning of fossil fuels and organic matter.

Tropical forests: The band of dense vegetation covering much of the equatorial region that is home to more than half the world's land-dwelling plant and animal species. Cleared of tree cover, the thin soils of tropical forests are vulnerable to erosion caused by the heavy rainfall and intense sun of the tropics.

Endangered species: Species of plants and animals that face extinction because of human activity. Under the Endangered Species Act, plants and animals in the United States under threat are identified and protected.

Methane (CH_4): Also known as natural gas, methane is produced through bacterial activity in rice paddies and in the digestive tracts of cud-chewing animals, such as cows, and certain insects. CH_4 is twenty-five times more effective at trapping heat in the atmosphere than CO_2.



(which generates 17 percent of the world's electricity) and hydroelectric power (which supplies 18 percent) are the most well-established renewable energy technologies. Nuclear power was initially greeted with enthusiasm in the 1950s as a source of clean, inexpensive energy, but several accidents at nuclear reactors have focused public attention on its dangers. Nonetheless, many countries continue to rely heavily on nuclear energy. France, for example, meets 75 percent of its electricity needs with nuclear power. Hydroelectric power has also encountered mounting opposition in recent decades. As environmentalists emphasize, the dams that are necessary for hydroelectricity choke off rivers and disrupt fragile ecosystems downstream.

Newer renewable energy technologies are safe and environmentally friendly, but have been held back by questions of cost and reliability. Together, they produce less than 1 percent of the world's electricity. In the last decade, the price of wind power has dropped five times in California — the state at the forefront of developing renewable energy sources. Nonetheless, it remains almost twice as expensive as natural gas for California utilities. In the field of solar energy, the most significant advances have centered on the refinement of photovoltaic cells, which convert sunlight into electricity. Tens of thousands of cells are already used in remote areas of Africa and Latin America to bring power to villagers who are not connected to electricity grids.

Still more experimental is fusion energy. Fusion, which produces energy by forcing the nuclei of atoms together, promises an endless supply of virtually pollution-free power. Fusion research, however, demands large-scale investment. In the 1996 U.S. budget, $244 million has been earmarked for the study of fusion. Meanwhile, an international effort that would include U.S., Japanese, Western European, and Russian scientists in a plan to build a prototype fusion reactor would carry a $6 billion pricetag for the nations involved.

Dilemmas of Economic Development

The economic and political forces of the 20th century have divided the nations of the world into four broad categories. Each region faces a distinct set of environmental challenges and concerns.

The developed world

The developed world produces over half of the world's wealth, consumes most of the world's resources, and is primarily responsible for the pollutants that contribute to global warming, ozone depletion, and acid rain. The United States alone accounts for 20 percent of the world's carbon dioxide emissions.

Americans, like people throughout the developed world, are particularly dependent on oil. Although the United States is the second leading producer of oil in the world, consumption far exceeds production. In 1994, U.S. petroleum usage exceeded production by nearly two and one-half times.

As the area that industrialized first, the developed world has experienced many of the planet's worst environmental problems. Coal use in England, for example, left many of the country's cities black

with soot and led to severe health problems. As late as 1952, smog was responsible for the deaths of more than 4,000 people in London. In recent decades, however, successful efforts have been made to reduce the severity of air and water pollution problems throughout the developed world. Developed nations have also been responsible for placing environmental problems on the international agenda.

The former Soviet bloc

The former Soviet bloc — the countries of the former Soviet Union and Eastern Europe — suffers from many of the worst features of industrialization. Under communism, the former Soviet bloc underwent a crash program of industrial development. Although progress was achieved in heavy industry, these countries failed to attain the affluence of the developed world. They also lacked the means to clean up many of their most serious environmental problems.

Much of the former Soviet bloc today relies on poor-quality, high-polluting coal and backward, energy-inefficient technologies. In Russia, for example, government subsidies have kept energy prices artificially low and have encouraged waste. As a result, Russian factories use twice as much energy as their American counterparts for the same output. Meanwhile, Russian energy officials estimate that 25 percent of their country's natural gas production is lost to leakage and inefficiency. Nuclear power facilities also pose a serious threat in much of the former Soviet bloc. The explosion within a nuclear reactor at Chernobyl in Ukraine in 1986 heightened fears about twenty other facilities with similar designs.

The Chernobyl disaster resulted in increased awareness of environmental problems and spurred the development of environmental organizations in many countries of the former Soviet bloc. Since the collapse of the Soviet Union in 1991, however, economic and political problems have overshadowed the environment in Russia and its neighbors.

Newly industrializing countries

Newly industrializing countries consist mostly of nations in Asia and Latin America that have embarked on economic programs emphasizing rapid industrial development. Success stories for this approach include South Korea and Taiwan. Other countries, such as Mexico, China, India, and Brazil, are pursuing a similar course. Many of these countries have made progress in curbing population growth and are now anxious to catch up with the developed world. They have turned largely to fossil fuels to transform their societies.

China, for example, has become the world's largest producer and consumer of coal. Within twenty-five years, China is expected to overtake the United States and the former Soviet Union as the leading emitter of greenhouse gases. Coal's relative low cost and abundance has made it attractive for China and other poor countries on the road to industrialization, but there is an increasingly heavy price to be paid in the form of polluted skies and acid rain.

In many emerging manufacturing areas, pollution rivals the worst period of industrialization in the United States and Europe. Cities like Jakarta, Indonesia and Calcutta, India suffer from thick smog caused primarily by the burning of poor-quality coal and organic matter. The use of private cars has shot up in Mexico, Brazil, and other developing nations, but few have fuel-efficiency standards and air quality regulations.

The modernization of agriculture has also contributed to pollution in newly industrializing countries. Farmers today, even in poor areas, often rely on gasoline-powered vehicles and agricultural chemicals to boost food production. New varieties of plants and improvements in technology have allowed farmers to expand the land area under cultivation worldwide by 450 percent in the past 300 years.

The growing emission of methane gas is typical of the many trade-offs associated with the advance of agriculture. Generated by bacteria in the stomachs of livestock and in the soil of rice paddies, methane retains heat in the atmosphere more efficiently than carbon dioxide. As farmers have planted more rice and increased their herds, concentrations of methane in the atmosphere have risen at four times the rate of carbon dioxide. Methane accounts for an estimated 12 to 20 percent of global warming.

Leaders of newly industrializing states argue that they need to keep their farms and factories

moving ahead to improve the lives of their people. They want wealthier countries to provide financial assistance to help them install new technologies to reduce greenhouse gas emissions and phase out the use of CFCs.

The underdeveloped world

The underdeveloped world is formed by the poorest countries, located mostly in Africa and South Asia. In these countries, environmental problems are caused less by industrialization than by growing numbers of people relying on the land for food and fuel. Deforestation, desertification, and declining biodiversity are widespread in the underdeveloped world. Since the population of many underdeveloped countries is rising rapidly, pressure on resources will continue to mount.

The past two and one-half decades in the Sahel region of Africa have tragically illustrated the crisis facing much of the underdeveloped world. The Sahel is an arid region located on the southern fringe of the Sahara desert. Abundant rainfall in the 1950s and 1960s led to increased farming of high-priced export crops, such as peanuts. People moved from areas in the south to cultivate crops on lands of the Sahel that had not been farmed for centuries. As more land was used for export crops, less was available to grow basic staples and to graze livestock. The over-cultivation and over-grazing in this fragile area robbed the soil of nutrients and led to erosion. When a stubborn drought began in the early 1970s, the land was unable to support the people and animals. Hundreds of thousands of people in Ethiopia, Sudan, and elsewhere in the Sahel have starved as a result. The famine that struck Somalia in 1992, prompting U.S. troops to intervene to protect relief efforts, was brought on in part by the Sahel's desertification.

Because of their often desperate conditions, many underdeveloped countries are more open to far-reaching global programs. Bangladesh, the Maldives islands, and other low-lying countries are particularly concerned that rising sea levels resulting from global warming may flood their lands. In response to this threat, the 37-member Alliance of Small Island States is pressing for swift action to curb emissions of greenhouse gases.

At the same time, many underdeveloped nations fear losing control of their natural resources to wealthier countries. For example, underdeveloped countries want a share of the profits from new agricultural, medical, and industrial products derived from plants and animals within their borders.

Part III: Environmental Issues on the International Agenda

Since the earliest days of international diplomacy, states have generally come together to discuss matters of war and trade. The health of the environment, if considered at all, was thought of strictly in a local context. Recent years, however, have witnessed a conceptual leap.

Not only have scientific terms such as greenhouse gases and the ozone layer entered the vocabulary of public policy, but environmental problems are increasingly seen as global in scope. Whether the issue is acid rain over the Great Lakes, the destruction of the rainforest in the Amazon River basin, or desertification in Africa's Sahel, there is a growing sense that the fate of the planet's ecology belongs on the international agenda.

Several international conferences in the 1990s have raised the profile of global environmental problems. Most important was the UN Conference on Environment and Development that took place in 1992 in Rio de Janeiro, Brazil. The twelve-day meeting, known as the Earth Summit, was the largest gathering of national leaders in history. A little over two years later, the UN International Conference on Population and Development convened in Cairo, Egypt to discuss the relationship between overpopulation, economic development, women's rights, and global environmental problems. In 1995, many of the same countries sent representatives to Berlin, Germany to consider the implications of global warming.

The North-South Divide

In addition to casting a spotlight on environmental issues, the meetings in Rio de Janeiro, Cairo, and Berlin served to highlight a widening division in international relations. At both conferences, the political battles pitted the wealthy, developed nations of the North against the poor, developing countries of the South. The dispute is not about the importance of the earth's ecology, but about questions of responsibility and obligation.

Developed nations point to the spiraling population growth rates and the often reckless industrialization of the developing world as the chief threat to the environment. They want poor countries to take stronger measures to curb population growth and address environmental problems. In contrast, developing nations point the finger at the developed economies, noting that they consume most of the world's resources and emit most of the pollutants. They argue that the need for economic development in poor countries cannot be overlooked in efforts to clean up the global environment, and that rich countries should absorb the bulk of the costs in helping poor nations meet international environmental standards.

International agreements

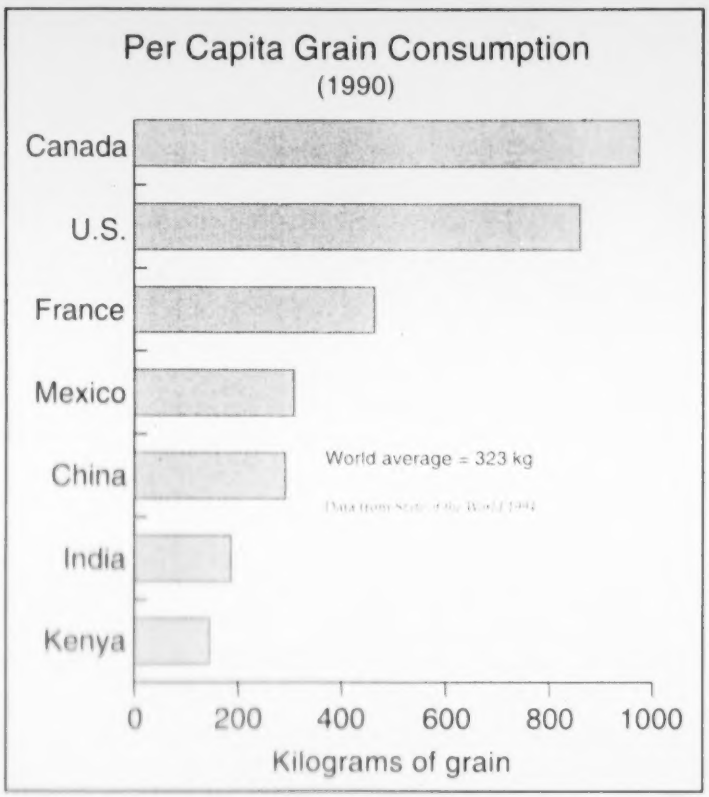
Many aspects of the North-South dispute are reflected in the agreements produced at the Earth Summit. Most ambitious is Agenda 21, an 800-page set of guidelines that covers both the environment and economic development, while avoiding many of the thorniest issues. Population growth is hardly mentioned, due to pressure from developing countries. At the same time, developed nations largely succeeded in protecting corporations that operate in many countries from new regulations. The Commission on Sustainable Development was created to hold governments accountable for implementing Agenda 21, but the commission has no enforcement power other than international pressure.

The Earth Summit also produced two legally binding treaties: the Framework Convention on Climate Change and the Convention on Biological Diversity. The United States and other developed countries originally had intended to craft a strong treaty on deforestation that would have banned logging in tropical forests. Many developing countries, however, balked at sacrificing their economic growth in the name of environmental protection. India and Malaysia, for example, campaigned against measures that would have regulated their tropical wood industries. Instead, they put forward proposals to restrict logging in the forests of the developed world. Unable to agree, participants endorsed a vague statement of

principles on preserving the world's forests.

Three years later in Berlin, many of the same divisions persisted. Countries from the developed world and the former Soviet bloc laid preliminary plans for a treaty to reduce greenhouse gas emissions after 2000. Developing nations, however, were exempted from the more rigorous guidelines. Instead, they agreed to a formula that would allow developed countries to gain credit toward their reduction targets by funding programs to curtail greenhouse gas emissions in the developing world.

At the 1994 Cairo population conference, developed countries emphasized the need to expand population control programs and to improve women's health services in poor nations. Leaders from the developing world voiced concern that foreign aid for family planning was an attempt to impose Western values on their cultures. After over a week of often heated debate, the participants put forth a plan of action that aimed to stabilize the world's population at 7.27 billion by 2015.



Foreign aid

At the center of the North-South divide is the issue of foreign aid. Organizers of the Earth Summit estimated that $125 billion in aid would be needed annually to implement the conference's recommendations. Meeting that target would require developed countries to increase foreign aid spending by 70 percent.

A number of Western European countries responded with a pledge to contribute 0.7 percent of their gross national product to development assistance by the year 2000. Western Europe's economic recession, however, forced many of them to scale back their contributions. Likewise, Americans have shown little enthusiasm for increasing foreign aid spending.

Since the Earth Summit, the controversy surrounding foreign aid has been played out primarily in the Global Environment Facility (GEF). In 1994, developed countries pledged to donate $2 billion to the GEF over three years to help poor nations meet the standards set at the Earth Summit.

Developing countries have long pressed for a larger voice in determining how foreign aid is spent. Many are especially critical of the World Bank, which has a key administrative role in the GEF. They contend that the World Bank largely represents the interests of the developed world. In hopes of bridging the North-South gulf, GEF member states have agreed to a compromise decision-making procedure for allocating aid.

Roots of conflict

North-South issues have deep historical roots. During the 19th and early 20th centuries, the leading nations of what is today the developed world competed to establish colonies abroad to gain access to raw materials and open up new markets for their manufactured goods. By the turn of the century, nearly the entire continent of Africa and much of Asia were under the control of Britain, France, and other imperial powers. (U.S. colonies included the Philippines and Cuba.)

Although almost all of the colonies gained independence after World War II, the impact of colonialism has continued to influence international relations. Economic links between the former colonies and the former imperial powers remain important. In addition, leaders of the developing world often blame colonialism for many of the problems that currently afflict their countries.

Since the early 1970s, North-South friction has spilled over into the arena of international environmental policy. For example, a series of agreements to protect the ozone layer by limiting the use of CFCs and methyl bromide has met opposition in the developing world. China and India have both invested in CFC technology, and initially refused to sign the treaties.

As an incentive to gain the participation of China, India, and other newly industrializing countries in the effort, wealthy countries have contributed nearly $500 million to an international fund to help developing nations shift to other technologies. Developing nations have also been given an extra ten years — until 2006 — to phase out CFCs.

Even as officials from developed countries urge their counterparts in poor nations to curb pollution, leading corporations often add to the environmental problems of the developing world. Many chemical manufacturers based in the United States, Western Europe, and Japan have moved factories to developing countries because they face fewer pollution restrictions there. Likewise, logging companies in the tropical forests of South Asia and West Africa encounter less opposition to their operations than in the developed world.

The international trade in hazardous waste disposal has, in particular, deepened North-South tensions. As developed countries have tightened their own pollution laws, producers of hazardous wastes have increasingly turned to poor countries to find inexpensive dumping grounds. One of the most highly publicized examples occurred in 1988, when Nigerian authorities refused to accept a ship loaded with chemical wastes from Italy.

Such incidents spurred poor countries to call for a worldwide ban on the dumping of hazardous wastes outside of the source country. The United States, Japan, and several other developed countries, however, opposed a complete ban on international shipments of hazardous wastes. The agreement that finally emerged from negotiations called for greater regulation. Neither the United States, which criticized the restrictions, nor many African countries, which advocated a total ban, have voiced enthusiasm for the treaty.

Meanwhile, developing nations have argued that the developed world frequently uses environmental regulations as a barrier to trade. In 1990, for example, Congress enacted legislation that forced the U.S. tuna industry to give up driftnet fishing — a practice that efficiently catches tuna but also drowns thousands of dolphins. Although most countries sought to meet U.S. standards for protecting dolphins, the tuna industries of Mexico and two other nations failed to comply.

In accordance with the 1990 law, American environmental organizations made sure that an embargo was imposed on Mexican tuna. Mexico, however, countered by arguing that the U.S. embargo obstructed free trade, and it won a favorable decision from the body that oversees international trade. Nonetheless, the Mexican government ordered fishermen to stop catching tuna with driftnets in order to protect Mexico's image in the United States.

Determining U.S. Policy

No country has as much impact on the global environment as the United States. With 5 percent of the world's population, the United States consumes over 20 percent of the world's energy and produces over 20 percent of the world's output of goods and services. In the area of international relations, the United States has occupied center stage since the 1940s and has played a prominent role in environmental affairs.

The United States can take credit for supplying much of the early initiative to address global environmental problems. The American public's concern over air and water pollution first surfaced as an important political issue in the 1960s. The passage of the National Environmental Policy Act and the creation of the Environmental Protection Agency in 1970 served as

an early model for other developed countries. Public sentiment also prompted the United States in 1972 to take the lead in organizing the first major international conference, held in Stockholm, Sweden, on global environmental problems.

The advances have been substantial. Over the past three decades, anti-pollution measures have resulted in marked improvements in air and water quality in the United States.

The election of Ronald Reagan as president in 1980 brought a more conservative outlook on environmental issues to the White House. President Reagan, and later George Bush, sought to reduce governmental regulation of the economy and, in turn, opposed environmental measures that hampered economic growth. Meanwhile, other developed nations adopted stronger environmental legislation. By 1992, limits on air pollution in Japan and Germany were nearly four times as stringent as those in the United States.

President Bill Clinton has elevated the profile of environmental issues. He has favored tightening the enforcement of environmental regulations and bringing the United States into line with other developed countries on international environmental policy. Clinton, however, has backed away from proposals to raise fuel-efficiency standards for vehicles.

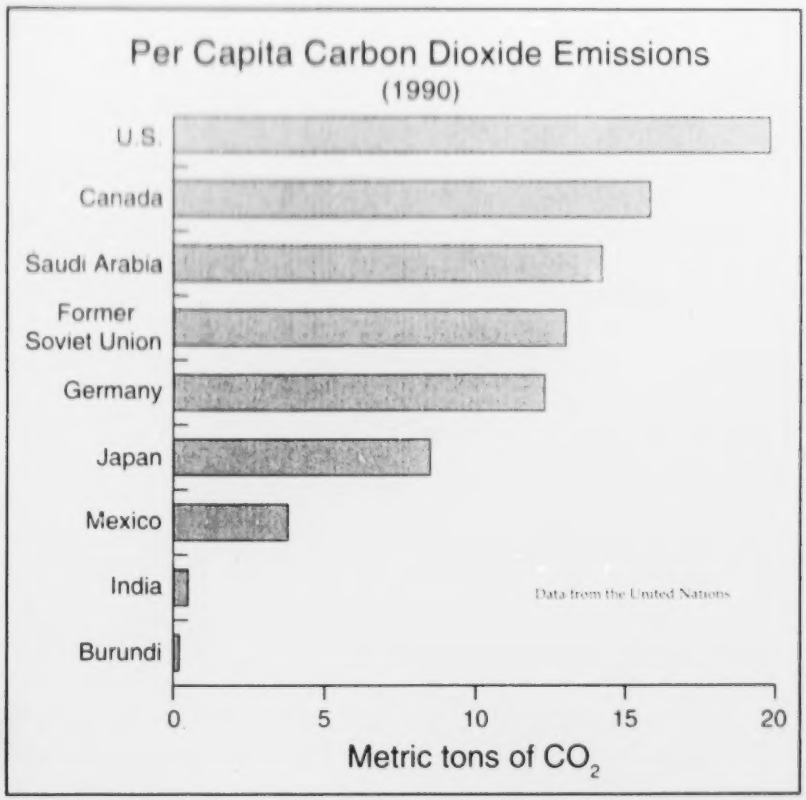
Environmentalist critics of U.S. policy warn that the most difficult ecological choices lie ahead for Americans. They insist that the United States should take stronger action to limit the destruction of natural habitats and control greenhouse gas emissions. At the opposite pole are those who argue that existing environmental regulations undermine business and infringe unfairly on the rights of property owners.

Regulations and guidelines

The United States already spends more money on the environment — just over 2 percent of the gross national product — than any other country. Most of that spending is borne by businesses in response to government regulations. The 1990 Clean Air Act, for example, requires industry to reduce emissions of sulfur oxides, nitrogen oxides, and other pollutants.

The Earth Summit's climate change treaty has added a new set of priorities to U.S. environmental policy. Under the treaty, the United States is committed to reducing greenhouse gas emissions to 1990 levels by the year 2000. Clinton's plan for compliance relies mainly on voluntary measures to promote conservation, reduce pollution, and restore natural habitats. Clinton, however, has warned that new regulations could be imposed if businesses fail to adopt his guidelines.

Meanwhile, Clinton administration officials have dropped earlier efforts to use tax policy as an instrument for attacking pollution. Environmental advocates in the Clinton administration had initially supported taxes on the carbon content in fossil fuels. They wanted pollutants to be put in the same category as alcohol and tobacco —



harmful substances that are heavily taxed to discourage consumption. Five European countries have imposed carbon taxes based on the same principle.

Environmentalists note that taxes on gasoline in this country are a fraction of those in Western Europe and Japan. While Germans, for example, pay about $1.50 in taxes for a gallon of gasoline and the French pay more than $2 a gallon, U.S. consumers pay, on average, less than forty cents per gallon in state and federal taxes. Opponents of the plan, however, fear the economic impact of a carbon tax. They argue that the burden would fall heaviest on poor and middle-income automobile owners.

Republicans in Congress have made the rollback of environmental regulations one of their top priorities. They have called for a moratorium on new regulations and deep spending cuts in Clinton's program to reduce greenhouse gas emissions.

Promoting "green" industries

Environmental policy also touches on the government's role in the economy. Unlike President Bush, Clinton believes that the government should invest in developing environmentally sound technologies to ensure that the United States is competitive with Japan and Western Europe in the emerging "green" market.

President Clinton's initiatives include a partnership between the government and American automakers in order to produce a family-size car that would be three times more fuel-efficient than existing vehicles. In addition, the president ordered the federal government to buy paper made from at least 20 percent recycled fiber by the end of 1994 and 30 percent by the end of 1998.

Environmentalists want American business executives to follow the lead of Japan. Japanese corporations are urged to prepare for a new phase of international competition by exceeding the environmental standards of foreign countries in which they operate. They note that the Japanese government is already investing in technologies designed to be environmentally friendly.

At the same time, American scientists are lobbying Washington to fund research projects that promise a greener future. They point to earlier partnerships between government and scientists that achieved success — such as the project to develop an atomic bomb and the program to land an astronaut on the moon.

Critics of such proposals are wary of a government hand in picking winners and losers among emerging technologies, arguing that free market competition is a better decision-maker. They contend that the cause of environmentalism is often used to camouflage the interests of those advocating expanded government control over the economy and a broader role for international organizations.

Industry has complained the loudest about the role of environmentalism in policymaking. General Motors, Ford, and Chrysler, for example, lobbied California officials to relax a law that would have required that 2 percent of the cars sold in the state by 1998 be pollution-free. Although General Motors announced plans in early 1996 to begin offering electric cars in California and Arizona, the auto companies maintain that government-imposed deadlines are often unrealistic. General Motors executives forecast that, for now, they will be able to sell from 5,000 to 20,000 electric cars annually.

Both sides of the environmental debate appreciate that the distinction between domestic and international environmental issues has become increasingly blurred. Supporters of strong environmental measures, such as a carbon tax, typically hope that the United States will cooperate closely with other members of the international community to address environmental threats. In contrast, critics of such measures fear that, in the name of environmental protection, the United States will be hamstrung by internationally mandated regulations.

The U.S. position internationally

U.S. environmental policy in the international arena underwent a pronounced shift after the election of Bill Clinton. Under the Bush administration, the U.S. tone at the Earth Summit was often combative. U.S. officials led the developed world in arguing that poor countries should do more to help themselves. For example, they criticized governments in the

developing world for providing electricity and irrigation water at cut-rate prices. Selling natural resources too cheaply, they asserted, promoted inefficiency, waste, and pollution. The United States also lobbied to weaken the Earth Summit's climate change treaty and refused to sign the biodiversity treaty. Bush feared that the biodiversity treaty would allow foreign countries to claim a share of the profits and technology of U.S. biotechnology companies.

After coming to office, Clinton signed the climate change and biodiversity treaties, and contributed $430 million to the GEF. Nonetheless, U.S. greenhouse gas emissions have risen during the Clinton presidency. By 1995, Clinton administration officials, like most of their Western European counterparts, conceded that they would fall short of achieving the climate change treaty's targets for 2000.

Conclusion

You will have an opportunity in the coming days to consider a range of alternatives for U.S. policy on global environmental issues. Each of the four viewpoints, or options, that you will explore in the next part of this unit is based on a distinct set of values and beliefs. You should think of the options as a tool designed to help you better understand the contrasting strategies from which Americans may choose. At the end of this unit, you will be asked to make your own choices about where U.S. policy should be heading.

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Options in Brief

Option 1 — Putting the Economy First

Concern about the environment may be important, but for now the health of our nation's economy must assume top priority. At a time when millions of Americans are struggling financially, we can not afford environmental policies that will hamstring our economy. Thousands of American workers in the coal and timber industries have already lost their jobs because of environmental restrictions. These people should not be made to suffer in the name of a distant and uncertain threat. In the future, when our economy is stronger and scientific data is more conclusive, we will be better able to tackle whatever environmental problems may arise.

Option 2 — Taking the Lead

As the most powerful nation in the world, the United States must lead the world in confronting the challenges of the 21st century. Cleaning up the environment is already emerging as a key focus of science and industry. The United States cannot afford to lag behind in this field. Instead, we have an obligation both to ourselves and to the planet as a whole to take the lead in developing technologies that will protect the global environment. To accomplish our goals, the United States should avoid becoming entangled in the endless debates and discussions of international organizations. By acting decisively, not only do we provide a better world for future generations of Americans, but we ensure that the United States remains on the cutting edge of science and industry.

Option 3 — Sharing Environmental Leadership

Although the United States and other countries in the developed world have taken steps to curb pollution, the population growth and irresponsible development of many poor nations pose a mounting threat to the planet. Isolating ourselves from damage to the environment is not possible. Rather, we must join with other developed countries in seeking a solution. With the other developed nations, we should address the problems that lead to environmental destruction and oversee programs to implement environmentally responsible policies in poor countries.

Option 4 — Global Stewardship

With the survival of the planet at stake, global environmental problems outweigh national interests and must rank as the top priority on our national agenda. Unless we make major changes in the way people live, we are headed for catastrophe. The United States and the other countries of the developed world are largely responsible for our current situation. We and the other countries of the world have to channel our technological resources toward creating a global economy that is environmentally sustainable for generations to come. Like never before in human history, the environmental crisis requires that people everywhere work together for the good of our common earth.

Option 1

Putting the Economy First

Concern about the environment may be important, but for now the health of our nation's economy must assume top priority. That's what really touches the lives of Americans today. As a country, we must focus our attention on reinvigorating our economy in the competitive global market. At a time when millions of Americans are struggling financially, we cannot afford environmental policies that will hamstring our economy. Thousands of American workers in the coal and timber industries have already lost their jobs because of environmental restrictions. These people should not be made to suffer in the name of a distant and uncertain threat, particularly while scientists continue to debate the meaning of confusing research data. In the future, when our economy is stronger and scientific data is more conclusive, we will be better able to tackle whatever environmental problems may arise.

The last few decades have shown that Americans will act responsibly to reduce pollution in our country. No one wants to destroy the ecology of his or her own backyard. The answer to environmental problems, however, does not lie in more governmental restrictions on people's lives — especially restrictions imposed by international organizations. Americans have long proved that we can take care of our own problems. The rest of the world — including poor nations with skyrocketing populations and high-polluting industries — should also learn to act responsibly. More foreign aid or more power for international organizations will not solve their problems. For ourselves and citizens of other countries, we should continue to promote international free trade and economic growth. Whatever problems may be facing our country in the future, a United States that is economically vigorous will be able to respond more effectively.

What policies should we pursue?

- We should withdraw from international environmental agreements that limit U.S. authority over our country's economic and environmental policies.
- We should cut off foreign aid that supports the UN's growing bureaucratic web of environmental programs.
- We should reduce regulations that hamper the development of our oil, coal, and natural gas resources, and increase our country's dependence on imported energy.
- We should ensure that measures to protect our environment do not interfere with economic growth.
- We should promote economic growth by relaxing burdensome environmental regulations — such as fuel efficiency and pollution standards that hinder the auto industry.

How would Option 1 affect us?

Under Option 1, the U.S. government would do little to interfere with the progress of industry. In areas where environmental restrictions have stifled the economy, regulations would be revised. The forces of the free market would be allowed to determine prices for energy. Oil, coal, and natural gas would continue to serve as our most important sources of energy over the next decade. Eventually, however, market forces would likely lead to improved technology and lower prices for renewable energies, such as solar power. In the short term, our lives would change little under Option 1. Pollution may increase, but some industries would benefit from relaxed environmental standards and provide more jobs.

PROS

SUPPORTING ARGUMENTS

1. Relaxing environmental regulations will give U.S. industries an opportunity to cut costs and create new jobs.

2. By proceeding cautiously in response to the current sensationalism regarding environmental problems, the United States will avoid rash policy decisions and be in a better position to weigh ongoing scientific research.

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3. Staying out of restrictive international environmental agreements will allow the United States to maintain control over its environment and economy.

4. Withdrawing U.S. support for international environmental agreements will torpedo the efforts of UN bureaucrats to expand the regulatory power and authority of international organizations.

CONS

OPPOSING ARGUMENTS

1. Withdrawing from international environmental agreements will undermine decades of progress to combat pollution worldwide and doom future attempts to address global environmental problems.

2. Unless environmental problems are given high priority, U.S. science and industry will fall behind in an expanding field.

3. Neglecting environmental problems now will result in still greater harm to the health of both future generations and the planet as a whole.

4. By refusing to work with other countries on global environmental issues, the United States will find itself isolated from much of the international community.

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Option 2

TAKING THE LEAD

As the most powerful nation in the world, the United States must lead the world in confronting the challenges of the 21st century. Our place in tomorrow's world may very well be determined by how we respond today to environmental threats. Cleaning up the environment is already emerging as a key focus of science and industry. The nations of Western Europe and Japan recognize that new markets are opening up for environmentally friendly products, and are moving quickly to develop innovative technologies. The United States cannot afford to lag behind in this field. Instead, we have an obligation both to ourselves and to the planet as a whole to take the lead in developing technologies that will protect the global environment. By acting decisively, not only do we provide a better world for future generations of Americans, but we ensure that the United States remains on the cutting edge of science and industry.

To accomplish our goals, the United States should avoid becoming entangled in the endless debates and discussions of international organizations. Rather, we should carry out our own program. Unfortunately, many of the problems affecting our environment are located far beyond our borders. Poor countries that chop down rainforests, dump sewage into the ocean, or run outmoded factories that pollute the atmosphere harm the health of the entire planet. Just as we have given poor countries aid to help them stop the expansion of communism, now we should use foreign aid to persuade countries to improve their environmental record. At home, the United States should invest in new technologies that will give us a jump in the growing market for environmentally sound products. Taxes on pollutants, such as carbon dioxide, methane, and sulfur, should be imposed to spur our industries toward a cleaner, more efficient future. In the competitive world of the 21st century, the United States cannot afford to be second best.

What policies should we pursue?

- We should invest in the research and development of environmental technologies — especially in the area of renewable energy — that will be in demand internationally.
- We should promote energy efficiency, recycling, and the use of alternatives to fossil fuels by taxing the producers of pollution while giving tax breaks to companies that reduce pollution.
- We should use trade policy to pressure our trading partners to follow environmental practices that are in line with U.S. priorities.
- We should ensure that foreign economic aid is directed only to environmentally sound development projects that welcome U.S. environmental expertise.
- We should make sure that new international environmental programs do not harm U.S. interests.
- We should create a corps of environmental specialists to help poor countries curb pollution that threatens the global environment.

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How would Option 2 affect us?

Under Option 2, the U.S. government would actively encourage the development of new technologies designed to cope with environmental problems. Solar, fusion, and other non-polluting energy sources would particularly benefit from government-sponsored research programs. Industries producing environmentally friendly technologies would receive special tax breaks. In the short term, Americans would have to pay higher taxes to fund Option 2. In addition, stricter environmental standards would hurt a few heavily polluting industries, lead to higher prices for products that contribute to pollution, and require that Americans stop driving old cars that still use leaded gasoline. Some companies would be unable to meet the stricter standards, leaving workers unemployed. At the same time, though, the development of environmentally sound technologies would create new businesses and new jobs.

PROS

SUPPORTING ARGUMENTS

1. Developing environmentally sound technologies will put the United States in the lead in a crucial field and generate new jobs.

2. Investing now to break our dependence on fossil fuels and promote energy efficiency will give U.S. industry a key competitive edge for the future.

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3. Opening and closing trade opportunities will give developing countries a strong incentive to adopt responsible environmental policies.

4. Introducing environmentally sound technologies developed by U.S. industry will help clean up pollution worldwide.

CONS

OPPOSING ARGUMENTS

1. By acting alone in pursuing global environmental policies, the United States will offend our key allies and trading partners in the developed world that have already taken steps to address global environmental problems.

2. Because the causes and effects of many environmental problems are global, the countries of the world must work together to guarantee an effective response.

3. Pressuring poor countries to adopt environmental standards set exclusively by the United States will provoke resentment and defiance.

4. With the United States struggling to compete in the global economy, our country cannot afford to suddenly change our energy policies and invest in unproven technologies.

Option 3

SHARING ENVIRONMENTAL LEADERSHIP

Although the United States and other countries in the developed world have taken steps to curb pollution, the population growth and irresponsible development of many poor nations pose a mounting threat to the planet. Isolating ourselves from damage to the environment is not possible. Rather, environmental problems are of a global nature and can only be addressed cooperatively. We must join with other developed countries in seeking a solution. In foreign policy, a new consensus has already emerged among the United States, Japan, and the countries in Western Europe. Progress has been made in coordinating efforts to protect the oceans, Antarctica, the ozone layer, and other elements of the planet's ecosystem. By working as partners, the countries of the developed world have not only achieved their goals more effectively but have equitably shared the costs among themselves. In today's interconnected world, international cooperation on environmental problems is essential.

In the end, only the developed countries have the technological know-how and the economic strength to restore the health of the planet. Poverty, overpopulation, and backward technologies have forced desperate people in poor countries to scratch out their existence with little regard to the environment. With the other developed nations, we should concentrate on addressing problems that lead to global environmental destruction and oversee programs to implement environmentally responsible policies in poor countries. At the same time, we must also accept our share of the burden for protecting the health of the planet by adopting stronger measures to protect the environment at home.

What policies should we pursue?

- We should join with other developed countries to set the international agenda on global environmental problems.
- We should insist that international agencies which lend money to developing countries, such as the World Bank and the International Monetary Fund, support only environmentally sound development projects.
- We should increase aid to developing countries for projects that address global warming, the loss of biodiversity, and other global environmental problems.
- We should require that American corporations operating in developing countries uphold strict environmental standards.
- We should join with other developed nations to impose sanctions on countries that permit environmentally reckless development within their borders.
- We should support international scientific research projects on global environmental problems.

How would Option 3 affect us?

Under Option 3, the U.S. government would strengthen regulations to clean up the environment in accord with the standards of other developed countries. We would commit ourselves to reducing the emission of carbon dioxide and other greenhouse gases. Industries would receive government assistance to help them meet new environmental standards. In the short term, Americans would have to pay higher taxes to fund Option 3. In addition, stricter environmental standards would harm some industries and leave workers unemployed, as well as lead to higher prices for some goods. Companies producing environmentally friendly products, however, would prosper and expand. As individuals, we would also have to make small changes in our way of life, such as paying higher taxes for gasoline, to keep in step with measures in other developed countries. At the same time, though, Americans would benefit from sharing the costs of cleaning up the environment with people throughout the developed world.

PROS

SUPPORTING ARGUMENTS

1. Promoting consensus among developed countries on global environmental problems will pave the way toward greater cooperation on other international problems.

2. By setting aside part of their land for conservation in exchange for reductions in the debt they owe to developed countries, poor countries have shown that they are willing to cooperate with the developed world in protecting the environment.

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3. The level of cooperation achieved by developed countries in stopping the war in Bosnia, protecting the ozone layer, and negotiating international trade agreements indicates that they will be able to work effectively to broaden global environmental efforts.

4. Concentrating the economic muscle of the developed world behind the cause of protecting the global environment will persuade other nations to cooperate on reducing pollution.

CONS

OPPOSING ARGUMENTS

1. Just as the Europeans and Japanese take advantage of U.S. policies promoting free trade, our allies in the developed world will use environmental cooperation to gain an unfair competitive edge.

2. The bureaucracy and regulations required to coordinate international environmental efforts will be one more strand of red tape holding down the growth of U.S. businesses.

3. Poor countries will refuse to cooperate if the developed world takes the lead in setting global environmental policies that hamper their development.

4. As the leader of the developed world, the United States will be expected to increase foreign aid for environmental programs at a time when we need the money at home.

Option 4

GLOBAL STEWARDSHIP

With the survival of the planet at stake, global environmental problems outweigh national interests and must rank as the top priority on our national agenda. Other problems — like the budget deficit, crime, and poverty — are serious, but the looming environmental crisis threatens the very existence of humanity. Unless we make major changes in the way people live, we are headed for catastrophe. The United States and the other countries of the developed world are largely responsible for our current situation. The signs of environmental destruction that have emerged in the past few decades have alerted us that many of our basic assumptions must be re-examined. Our planet cannot survive the continued economic growth of developed countries and the desperate poverty of poor nations. Instead, we and the other countries of the world have to channel our technological resources toward creating a global economy that is environmentally sustainable for generations to come. Not only do we have to change our own lifestyles, but we must ensure that poor countries do not repeat our mistakes.

All countries — rich and poor — must have a voice in making our world a better place. Like never before in human history, the environmental crisis requires that people everywhere work together for the good of our common earth. The United States can serve as a leading force for cooperation by fully supporting the role of the UN in charting global environmental policy. A new global outlook would mean giving up some of our sovereignty to international organizations and embracing countries of the developing world as partners in global decision-making. We should be ready to substantially increase aid to poor countries and accept changes in our personal lifestyles. Whatever the sacrifice, though, it's worth it. We are all citizens of the same planet, and we all have an obligation to safeguard the world for future generations.

What policies should we pursue?

- We should join with the international community to grant authority to the UN to establish strong international environmental laws and take part in enforcing global environmental standards.
- We should ensure that poor countries have an equal voice in deciding global environmental policies.
- We should contribute 0.7 percent of our gross national product for assistance to developing countries, thus meeting the goal established by the UN.
- We should offer developing countries aid and technology that will help them to address environmental problems at the local level and to phase out high-polluting industrial processes.
- We should adopt as our own national laws the decisions of the UN on environmental matters.
- We should reduce the amount of resources we consume and shift our national priorities to create an economy that is environmentally sustainable.

How would Option 4 affect us?

Under Option 4, the U.S. government would introduce measures to restructure our economy based on environmentally sound principles. In cooperation with the other countries of the world, we would promote the development of industries that are capable of prospering in harmony with the environment. Industries that do not fit this plan would be phased out. The country would also move quickly toward cutting carbon dioxide emissions in half and developing non-polluting energy sources. In the short term, Americans would have to pay significantly higher taxes to fund Option 4. Many workers would face unemployment, at least temporarily, as the economy shifts toward sustainable growth. In addition, prices would rise on many goods. Over time, our dependence on gasoline-powered cars would give way to reliance on cleaner forms of transportation. The economy would eventually adjust, as industries become more energy efficient and produce more environmentally friendly goods. More important, Americans would benefit from an improvement in the planet's environment and could look forward to better personal health as pollution decreases.

PROS

SUPPORTING ARGUMENTS

1. Considering that poor countries are home to more than 80 percent of the world's people, their full participation is essential if we are to solve global environmental problems.

2. Reducing our country's consumption of resources will pay off in a cleaner environment here at home and an improvement in the health of our citizens.

&

3. Only by achieving a new level of international cooperation through the UN will humanity be able to address environmental problems that extend beyond national boundaries.

4. Poor countries will be unable to address global environmental problems without substantial economic assistance from the developed world.

CONS

OPPOSING ARGUMENTS

1. By turning over authority on environmental policy to international organizations, the United States will be relinquishing power to govern our country's land, water, and air to a faceless global bureaucracy.

2. An avalanche of stringent environmental regulations and big increases in government spending to fund new international environmental programs will drag down our economy for years to come.

3. Providing corrupt, incompetent governments in poor countries greater international influence and additional aid will do little to improve the environment.

4. U.S. industry, striving to sharpen its competitive edge, will be reluctant to develop new environmentally friendly technologies that would be shared with other countries.

Focusing Your Thoughts

Instructions: You have had an opportunity to consider four options on U.S. global environmental policy. Now it is your turn to look at each of the options from your own perspective. Try each one on for size. Think about how the options address your concerns and hopes. You will find that each has its own risks and trade-offs, advantages and disadvantages. After you complete this worksheet, you will be asked to develop your own option on this issue.

Ranking the Options

Which of the options below do you prefer? Keep in mind that the beliefs you support most strongly should guide your choice. Rank the options, with "1" being the best option for the United States to follow.

___ **Option 1: Putting the Economy First**

___ **Option 2: Taking the Lead**

___ **Option 3: Sharing Environmental Leadership**

___ **Option 4: Global Stewardship**

Beliefs

Rate each of the statements below according to your personal beliefs:

1 = Strongly Support
2 = Support
3 = Oppose
4 = Strongly Oppose
5 = Undecided

___ To solve global problems, rich and poor countries must work together.

___ As the most powerful nation in the world, the United States is capable of addressing international problems without relying on other countries.

___ The United States should not allow other countries to shape policies that affect the lives of Americans.

___ Countries that are poor and technologically backward have only themselves to blame.

___ The United States has a responsibility to share science and technology to help solve the most pressing problems in poor countries.

___ The health of the U.S. economy has a greater impact on the lives of Americans than any other issue.

___ The United States needs the help of Western Europe and Japan to deal with international problems.

___ Poverty, lack of development, and corruption have left many poor countries unable to cope with critical problems within their borders.

___ In our competitive world, the United States cannot afford to give up any advantage in science and technology.

___ Americans today need to make sacrifices in their way of life to safeguard the world for future generations.

Creating Your Own Option

Your next assignment is to create an option that reflects your own beliefs and opinions. You may borrow heavily from one option, or you may combine ideas from two or three options. Or you may take a new approach altogether. There are, of course, no perfect solutions. And there is no right or wrong answer. Rather, you should strive to craft an option that is logical and persuasive. Be careful of contradictions. For example, we should not offer to share our technology with other countries if our goal is to take the lead in industries that protect the environment.

Optional Reading: Following the Path of the Carbon Cycle

Carbon is a basic building block of life on earth. Every plant and animal — from single-celled amoebas to gigantic redwoods to our own human form — contains carbon. Carbon dioxide (CO_2), either present in the air or dissolved in water, is the source of the carbon found in most living matter.

Carbon dioxide is constantly on the move in the biosphere. What scientists call the "carbon cycle" is a natural process involving the interaction of the atmosphere, oceans, and land. Throughout most of the earth's recent history, there has been a rough balance between sources of carbon dioxide — such as decaying organic matter, animal and plant respiration — and sinks (or reservoirs) of carbon dioxide in the oceans and on land — such as living plants. Many aspects of the carbon cycle are measured in terms of decades, centuries, millennia, or even millions of years.

Human activity has disturbed the natural carbon cycle, especially since the onset of industrialization. In the modern era, oceanic and terrestrial carbon sinks have not absorbed the additional carbon dioxide discharged into the atmosphere by human activity. In 1750, the concentration of carbon dioxide in the atmosphere was 280 parts per million by volume (ppmv). Today, it is approaching 360 ppmv. Humanity has added extra carbon dioxide to the carbon cycle mainly through the combustion of fossil fuels and the spread of agriculture and grazing.

Fossil fuels represent carbon that was removed from the atmosphere in ages past by living plants and animals. When these organisms died, their remains accumulated in the earth's crust and were transformed into the deposits of oil, coal, and gas that we use today.

Fossil fuels were formed over millions of years. Since the late 18th century, however, humanity has been consuming fossil fuels at an accelerating rate. For example, scientists believe that nearly one-third of the world's oil reserves have already been depleted. As a result, carbon dioxide that had been stored in sedimentary layers for millions of years is suddenly being released into the atmosphere.

At the same time, the conversion of wilderness to farmland and pasture has reduced the capacity of the terrestrial biosphere to serve as a carbon sink. By clearing away forests and allowing livestock to strip away vegetation, humanity destroys plant life which stores carbon. Plowing the soil to prepare for planting also accelerates the decomposition of organic matter, leading to the release of carbon release.

Photosynthesis and respiration

A study of the carbon cycle requires an understanding of photosynthesis and respiration, the biological processes which sustain life both on land and in water. In photosynthesis, green plants and certain other organisms convert water and atmospheric carbon dioxide into simple carbohydrates, or sugar. The chlorophyll present in green plants acts as the catalyst (a substance that causes or accelerates a chemical reaction without being affected itself), while sunlight provides the energy source.

Reaction of Photosynthesis in Green Plants:

$$CO_2 + 2H_2O \xrightarrow{\text{light}} (CH_2O) + O_2 + H_2O$$

The carbohydrates produced by photosynthesis are the foundation of the food chain. The chemical energy generated by photosynthesis is put to work in the process of respiration to carry out cellular functions essential to life. Within the cells of organisms, enzymes break down the carbohydrates and other foodstuffs resulting from photosynthesis into the energy-rich compound adenosine triphosphate (ATP) or into components used for the production of the cell's macromolecules. (Some organisms break down foodstuffs through fermentation, a process that does not require oxygen.)

In the case of humans, we either eat the products of photosynthesis directly in the form of plants or indirectly in the form of animals that, in turn, have themselves consumed plants or plant-eating animals.

Photosynthesis also plays a fundamental role in the carbon cycle. In carrying out photosynthesis, plants remove carbon dioxide from the atmosphere. The carbon is then "fixed" within the tissue of living

plants or utilized for respiration. In addition, oxygen is released as a by-product of photosynthesis.

Carbon dioxide is returned to the atmosphere in the process of respiration. Animals take in oxygen and discharge carbon dioxide in the course of respiration. (In contrast to animals, plants consume more carbon dioxide in photosynthesis than they release through respiration.) Carbon dioxide is also released into the atmosphere when wood and other organic matter burn or decay.

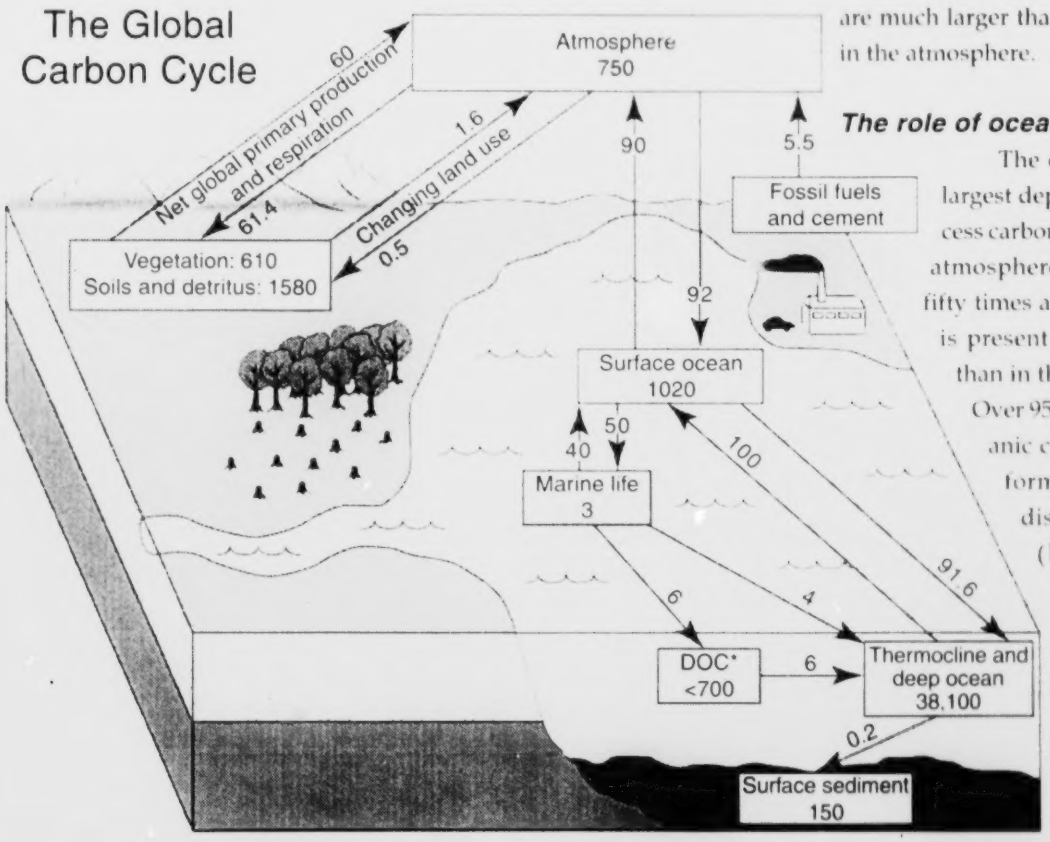
How the Carbon Cycle Works

Photosynthesis and respiration ensure that carbon dioxide is forever cycling between the atmosphere, the oceans, and the terrestrial biosphere. At the same time, carbon is being deposited in the earth's crust as layers of sediment.

Scientists have identified five key processes in the carbon cycle (see the graph below):

- The exchange of carbon dioxide between the atmosphere and the ocean;
- The exchange of carbon dioxide between the surface waters of the ocean and long-term storage in the deep ocean;
- The net release of carbon dioxide from changes in land use, such as deforestation;
- The photosynthesis of land plants, thus transferring carbon dioxide into long-term storage in wood and soils;
- The release of carbon dioxide into the atmosphere through plant and soil respiration.

The atmosphere is the buffer of the carbon cycle, with vital connections to both the oceans and the terrestrial biosphere. At the same time, the reservoirs of carbon in the oceans and on land are much larger than the reservoir in the atmosphere.



The numbers in the boxes indicate the size of each carbon reservoir in GtCs (1 GtC = 1 billion tonnes of carbon). The numbers matched with the arrows indicate the annual magnitude of carbon exchange in GtCs for the period between 1980 and 1989. (DOC = dissolved organic carbon.) *Reprinted from* Climate Change 1994, *a report by the UN Intergovernmental Panel on Climate Change, published by Cambridge University Press.*

The role of oceans

The oceans are the largest depository for excess carbon dioxide in the atmosphere. More than fifty times as much carbon is present in the oceans than in the atmosphere. Over 95 percent of oceanic carbon is in the form of inorganic dissolved carbon (bicarbonate and carbonate ions). The remainder consists of organic carbon, such as sea plants and

particulate and dissolved organic carbon.

The oceans absorb carbon dioxide through a three-step process:

- Carbon dioxide from the atmosphere is consumed by phytoplankton (microscopic plants, particularly algae) in the surface layer of the ocean during photosynthesis;
- Although most of the carbon dioxide is returned to the atmosphere, water circulation gradually transports dead plants and other organic matter containing carbon from surface waters to the mid-level thermocline layer and the deep ocean.
- As the organic matter decays, carbon dioxide is released into the water, and most of it becomes absorbed in the sea by chemically combining with water molecules to form carbonic acid (H_2CO_3).

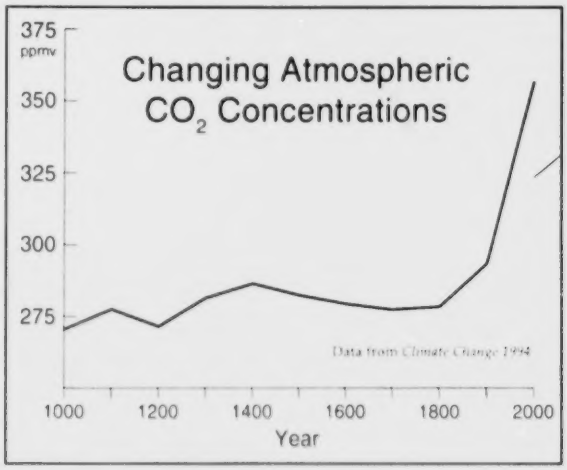
While the ocean serves as the earth's largest carbon sink, the process of oceanic carbon cycling takes place on a timescale of decades and centuries. Consequently, the ocean is not capable of absorbing a sudden increase in atmospheric carbon dioxide.

For this reason, the relatively small human sources of carbon dioxide loom much larger when viewed in the time frame of the carbon cycle. Returning the level of carbon dioxide in the atmosphere to pre-industrial levels would take hundreds of years, regardless of the actions humanity takes.

Even if carbon dioxide emissions could be held steady at present rates, scientists predict that atmospheric concentrations of carbon dioxide would rise for at least two centuries. By 2100, they would reach 500 ppmv, or nearly double the pre-industrial level.

The role of the terrestrial biosphere

The carbon reservoir on land consists of carbon dioxide that has been fixed within vegetation and soil, and, most significantly, deposited in layers of sediment. Up to 80 percent of the carbon above ground in the terrestrial biosphere and one-third of the carbon below ground are contained within forests. The two largest terrestrial sinks of carbon — the forests of Russia and the Amazon Basin — hold nearly half of the carbon stored in the world's forests. In the last two



centuries, the process of carbon fixation in the terrestrial biosphere has increasingly been disturbed by changes in land use from human activity.

Humanity has also built modern society on the energy resources of the terrestrial biosphere. Since the beginning of industrialization, scientists estimate that emissions from the burning of fossil fuels have pumped 230 billion tonnes of carbon dioxide into the atmosphere. (To a much smaller degree, cement production also releases carbon dioxide.)

In the 1980s, fossil fuel emissions averaged roughly 5.5 gigatons of carbon, or GtCs, annually (1 GtC = 1 billion tonnes of carbon; 1 tonne [metric ton] = 1,000 kilograms, or 2,204 pounds). Scientists have determined that the concentration of carbon dioxide in the global environment rose by 1.53 ppmv annually during the decade. The increase corresponds to an addition of 3.2 GtCs to the atmosphere every year. Changes in land use from human activity also inject carbon dioxide into the atmosphere.

Evaluating sources and sinks

Calculating humanity's effect on the carbon cycle is not a straight-forward exercise. Human activity is not only a source of carbon dioxide, but may also contribute to promoting carbon sinks. The following is a summary of the key factors in assessing humanity's role.

Deforestation and changes in land use: Burning organic matter and clearing away trees emits carbon dioxide to the atmosphere through the oxidation of

vegetation and soil carbon. From 1850 to 1990, deforestation and changes in land use resulted in emissions of 122 GtCs. Before the 1950s, the developed world was responsible for most of these emissions. Today, most of the carbon dioxide emissions from deforestation and changing land use are attributed to developing countries. During the 1980s, this class of emissions from the developing world totaled 1.6 GtCs annually.

Forest regrowth: As forests recover from logging, the new trees absorb carbon dioxide. Recent studies suggest that more carbon dioxide is now being absorbed by the forests of the developed world than is being released. Scientists estimate that the extent of the net carbon sink from the forests of the Northern Hemisphere ranges from essentially zero to 0.74 GtC annually.

Carbon dioxide fertilization: Studies show that heightened levels of atmospheric carbon dioxide result in increased rates of photosynthesis. Potentially, carbon dioxide fertilization could promote faster plant growth and lead to increased carbon storage in the terrestrial biosphere.

Nitrogen fertilization: Much like carbon dioxide fertilization, increased emissions of nitrogen into the atmosphere could result in increased plant growth and terrestrial carbon storage. Nitrogen is released through the combustion of fossil fuels and organic matter, and the use of chemical fertilizers.

Weighing the human component in the carbon cycle is further complicated by the interaction of the factors under consideration. The relationship between nitrogen and forest regrowth offers a good example. Nitrogen emissions, which are produced mostly by developed countries, tend to have a more localized effect than carbon dioxide emissions. Consequently, the forests of the developed world have experienced greater nitrogen fertilization than forests near the equator. At the same time, emissions of nitrogen oxides and sulfur oxides are the primary agents of acid rain. Scientists have shown that acid rain has damaged the health of many forests near industrial centers of the developed world. (See the table below for a summary of humanity's carbon budget.)

Drawing comparisons

While the balance of human forces remains complex, scientists are increasingly confident of their ability to measure the consequences of human activity in the carbon cycle. Their analysis indicates that the increase in atmospheric carbon dioxide concentrations to nearly 360 ppmv marks a sharp break with the recent past.

During the last ice age, carbon dioxide levels were roughly 190-200 ppmv, or 70 percent of pre-industrial concentrations. Beginning about 18,000 years ago, the earth gradually began to warm. Over the next 10,000 years, the mean surface temperature rose by 4 degrees Celsius and atmospheric carbon dioxide concentrations climbed at least 80 ppmv. During the last 1,000 years, carbon dioxide levels have fluctuated up to 10 ppmv per century around an average value of 280 ppmv.

Scientists believe that earlier fluctuations in carbon dioxide levels were caused by the influence of climatic changes on the oceanic and terrestrial ecosystems. They emphasize, however, that even the most dramatic swing in carbon dioxide levels, which occurred from 1200 to 1400, is small compared to the build-up of the 20th century.

Summary of Humanity's Annual Carbon Budget
(1980-1989)

Anthropogenic (human) CO_2 sources	
Emissions from fossil fuels and cement production:	5.5 GtC/yr
Net emissions from changes in land use in developing countries:	1.6 GtC/yr
Sinks of anthropogenic CO_2	
Storage in the atmosphere:	3.2 GtC/yr
Ocean absorption:	2.0 GtC/yr
Absorption by forest regrowth in the Northern Hemisphere:	0.5 GtC/yr
Additional terrestrial sinks (mainly CO_2 and nitrogen fertilization):	1.4 GtC/yr

Tools of measurement

Since the late 1950s, scientists have directly measured atmospheric concentrations of carbon dioxide from observation stations in Antarctica and Hawaii. To reach back into the past, however, they must rely on indirect measurement tools. Most useful has been the analysis of air trapped in polar ice cores. The air bubbles found in the massive icecaps surrounding the North and South Poles were formed as snow turned into ice.

Through their knowledge of carbon isotopes, scientists have determined that increased levels of atmospheric carbon dioxide are attributable to industrialization. Carbon-12 (C^{12}) and carbon-13 (C^{13}) are the most common carbon isotopes. When fossil fuels and organic matter are burned, the carbon that is released has a lower ratio of carbon-13 to carbon-12 than that which is generally found in the atmosphere.

Analysis of carbon dioxide has shown that the atmospheric level of carbon-13 relative to carbon-12 has declined about 1 percent over the last century. Such a decrease is consistent with humanity's emissions of carbon dioxide from the burning of fossil fuels and organic matter.

Climate feedback

Most challenging from a scientific standpoint — and most critical for humanity's future — is calculating the impact of global warming on the carbon cycle. Scientists call this effect "climate feedback."

The implications of global warming are likely to be most immediate for the terrestrial biosphere. On the one hand, the higher temperatures and increased precipitation that are expected to result from global warming should contribute to greater photosynthesis, faster plant growth, and higher levels of carbon fixation in living vegetation. On the other hand, rapidly changing climatic conditions would leave many species of plants unable to adjust. Vast swaths of forest could be wiped out. Higher temperatures and the erratic rainfall patterns that are forecast could lead to devastating droughts. Moreover, higher temperatures speed up the rate of decomposition of organic matter, thus reducing the capacity of soil to store carbon.

Emissions of carbon dioxide and other pollutants also increase the acidity of rainfall. In turn, acid rain contributes to the erosion of sedimentary rocks, such as limestone, where most of the earth's carbon is stored. Accelerated rates of erosion would inject additional carbon into the carbon cycle.

For the oceanic ecosystem, global warming is expected to have the greatest impact on ocean circulation and chemistry. Changes in water temperature and circulation patterns would have serious consequences for algae and other marine plants, and may impede the chemical reaction between carbon dioxide and dissolved inorganic carbon. The changes would, in turn, affect the exchange of carbon dioxide between the oceans and the atmosphere.

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Supplementary Documents

Rio Declaration on Environment and Development

The United Nations Conference on Environment and Development,
Having met at Rio de Janeiro from 3 to 14 June 1992,
Reaffirming the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, and seeking to build upon it,
With the goal of establishing a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people,
Working towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system,
Recognizing the integral and interdependent nature of the Earth, our home,
Proclaims that:

Principle 1

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 2

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 3

The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

Principle 4

In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

Principle 5

All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

Principle 6

The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.

Principle 7

States shall cooperate in a spirit of global partnership to conserve, protect, and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

Principle 8

To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

Principle 9

States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

Principle 10

Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

Principle 11

States shall enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries.

Principle 12

States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.

Principle 13

States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.

Principle 14

States should effectively cooperate to discourage or prevent the relocation and transfer to other States of any activities and substance that cause severe environmental degradation or are found to be harmful to human health.

Principle 15

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 16

National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Principle 17

Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

Principle 18

States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States. Every effort shall be made by the international community to help States so afflicted.

Principle 19

States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith.

Principle 20

Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development.

Principle 21

The creativity, ideals and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

Principle 22

Indigenous people and their communities and other local communities have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture, and interests and enable their effective participation in the achievement of sustainable development.

Principle 23

The environment and natural resources of people under oppression, domination, and occupation shall be protected.

Principle 24

Warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.

Principle 25

Peace, development and environmental protection are interdependent and indivisible.

Principle 26

States shall resolve all their environmental disputes peacefully and by appropriate means in accordance with the Charter of the United Nations.

Principle 27

States and people shall cooperate in good faith and in a spirit of partnership in the fulfillment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

Suggested Reading

Black, Michael and Fischer, Frank, eds. *Greening Environmental Policy: The Politics of a Sustainable Future* (New York: St. Martin's Press, 1995). 221 pages.

Bolch, Ben and Lyons, Harold. *Apocalypse Not: Science, Economics, and Environmentalism* (Washington, D.C.: Cato Institute, 1993). 139 pages.

Easterbrook, Gregg. *A Moment on the Earth: The Coming Age of Environmental Optimism* (New York: Viking Press, 1995). 745 pages.

Goldfarb, Theodore E. *Taking Sides: Clashing Views on Controversial Environmental Issues.* 4th ed. (Guilford, Connecticut: The Dushkin Publishing Group, Inc., 1991). 334 pages.

Gore, Al. *Earth in the Balance: Ecology and the Human Spirit* (Boston: Houghton Mifflin Company, 1992). 407 pages.

McKee, David L. *Energy, the Environment and Public Policy: Issues for the 1990s* (New York: Praeger, 1991). 220 pages.

Mowrey, Marc. *Not in Our Backyard: The People and Events that Shaped America's Modern Environmental Movement* (New York: W. Morrow, 1993). 496 pages.

Silver, Cheryl Simon and DeFries, Ruth S. *One Earth One Future: Our Changing Global Environment* (Washington, D.C.: National Academy Press, 1990). 196 pages.

World Resources Institute, UN Environment Programme and UN Development Programme. *World Resources* (New York: Oxford University Press, published biennially).

Worldwatch Institute. *State of the World: A Worldwatch Institute Report on Progress Toward a Sustainable Society* (New York: W. W. Norton and Company, published annually).

Information on the environment is available electronically to subscribers of the ECONET telecommunications services sponsored by the Institute for Global Communications. For more information on this service, write to ECONET, 18 deBoom Street, San Francisco, CA 94107, call (415) 442-0220, or visit ECONET's site on the World Wide Web at: http://www.econet.apc.org/econet/.

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- Crisis, Conscience, and Choices: Weimar Germany and the Rise of Hitler (Nov. 1994, 84 pages)
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Teacher's
Resource
Book

CHOICES FOR THE 21st CENTURY

Global Environmental Problems: Implications For U.S. Policy

ALTERNATIVES FOR PUBLIC DEBATE
AND POLICY DEVELOPMENT

A program of the Thomas J. Watson Jr.
Institute for International Studies

Brown University, Box 1948, Providence, RI 02912

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CHOICES

for the 21st Century Education Project

March 1996

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The Choices for the 21st Century Education Project develops curricula for high schools and colleges on current foreign policy issues and offers workshops, institutes, and in-service programs for high school teachers. Course materials place special emphasis on the importance of educating students in their participatory role as citizens.

The Choices for the 21st Century Education Project is a program of the **Thomas J. Watson Jr. Institute for International Studies** at Brown University.

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Director

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The Choices for the 21st Century Education Project is a program of the Thomas J. Watson Jr. Institute for International Studies at Brown University. Choices was established to help citizens think constructively about foreign policy issues, to improve participatory citizenship skills, and to encourage public judgment on policy priorities.

The Thomas J. Watson Jr. Institute for International Studies was established at Brown University in 1986 to serve as a forum for students, faculty, visiting scholars, and policy practitioners, who are committed to studying global problems and developing international initiatives to benefit society.

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About the Choices Approach

Choices for the 21st Century curricula are designed to make complex international issues understandable and meaningful for students. Using an innovative approach to student-centered instruction, Choices units develop critical thinking and civic judgment — essential ingredients of responsible citizenship.

Understanding the Significance of History: Each Choices unit provides students with a thorough introduction to the topic under consideration. Students gain an understanding of the historical background and the status of current issues. In this way, they see how history has shaped our world. With this foundation, students are prepared to thoughtfully consider a variety of perspectives on public policy.

Exploring Policy Alternatives: Each Choices unit is built around a framework of alternative policy options that challenges students to consider multiple perspectives and to think critically about the issue at hand. Students are best able to understand and analyze the options through a cooperative learning/role-play activity. In groups, students explore their assigned options and plan short presentations. The setting of the role-play may be a Congressional hearing, meeting of the National Security Council, or an election campaign forum. Student groups defend their policy options and, in turn, are challenged with questions from their classmates. The ensuing debate demands analysis and evaluation of the many conflicting values, interests, and priorities reflected in the options.

Exercising Civic Judgment: Armed with fresh insights from the role-play and debate, students are challenged to articulate original, coherent policy options that reflect their own values, priorities, and goals as individuals and citizens. Students' views can be expressed in letters to Congress or the White House, editorials for the school or community newspaper, persuasive speeches, or visual presentations.

Why Use the Choices Approach? Choices curricula are informed by current educational research about how students learn best. Studies have consistently demonstrated that students of all abilities learn best when they are actively engaged with the material rather than listening passively to a lecture. Student-centered instructional activities motivate students and develop higher-order thinking skills. However, some high school educators find the transition from lecture format to student-centered instruction difficult. Lecture is often viewed as the most efficient way to cover the required material. Choices curricula offer teachers a flexible resource for covering course material while actively engaging students and developing skills in critical thinking, persuasive writing, and informed citizenship. The instructional activities that are central to Choices units can be valuable components in any teacher's repertoire of effective teaching strategies. Each Choices unit includes student readings, a framework of policy options, suggested lesson plans, and resources for structuring cooperative learning, role-plays, and simulations. Students are challenged to:

- recognize relationships between history and current issues
- analyze and evaluate multiple perspectives on an issue
- understand the internal logic of a viewpoint
- engage in informed debate
- identify and weigh the conflicting values represented by different points of view
- reflect upon personal values and priorities surrounding an issue
- develop and articulate original viewpoints on an issue
- communicate in written and oral presentations
- collaborate with peers

Teachers who use Choices units say the collaboration and interaction that take place are highly motivating for students. Opportunities abound for students to contribute their individual talents to the group presentations in the form of political cartoons, slogans, posters, or characterizations. These cooperative learning lessons invite students to take pride in their own contributions and the group product, enhancing students' self-esteem and confidence as learners. Choices units offer students with diverse abilities and learning styles the opportunity to contribute, collaborate, and achieve.

Note to Teachers

Until recently, concern about the environment revolved almost exclusively around local and national problems. The smog of Southern California, the pollution of the Great Lakes, and the nuclear accident at Three Mile Island dominated our thinking about environmental issues. In the past decade, however, scientists have increasingly focused attention on a new set of environmental threats, such as global warming, ozone depletion, and acid rain, that transcend national boundaries. A new concept — global environmental problems — has entered the public arena, especially in the area of foreign policy and economic matters.

Global Environmental Problems: Implications for U.S. Policy explores the relationship between public policy in our country and the health of the planet. With this unit, students will join in the process of defining global environmental problems and grapple with the same tough questions that are confronting U.S. policymakers.

At the core of the unit is a framework of four distinct options that allows students to consider a range of alternatives for U.S. policy toward global environmental problems. By exploring a wide-ranging spectrum of alternatives, students gain a deeper understanding of the values underlying specific policy recommendations. The background reading was written with the complexities of the debate on the environment in mind. Part I and Part II briefly explain the causes and effects of the leading global environmental problems, while Part III discusses the environmental agenda of the international community and examines key components of the controversy over environmental policy in the United States.

Suggested Five-Day Lesson Plan: The Teacher's Resource Book accompanying *Global Environmental Problems: Implications for U.S. Policy* contains a day-by-day lesson plan and student activities. The lesson plan begins by introducing students to the concept of global environmental problems. The second day of the lesson plan engages students in a role play that delineates the contrasting perspectives of different regions of the world toward environmental issues. In addition, there is an optional science lesson that examines humanity's impact on the global carbon cycle. After studying the scientific causes and international ramifications of global environmental problems, students evaluate U.S. options in the course of a two-day simulation. Finally, they apply what they have learned to developing their own recommendations for U.S. policy. You may also find the "Alternative Three-Day Lesson Plan" useful.

The lesson plan offered in *Global Environmental Problems: Implications for U.S. Policy* is a guide. Many teachers choose to devote additional time to certain activities. We hope that these suggestions help you in tailoring the unit to fit the needs of your classroom.

Integrating This Unit into Your Curriculum

Units produced by the Choices for the 21st Century Education Project are designed to be integrated into a variety of social studies courses. Because of the interdisciplinary approach of *Global Environmental Problems: Implications for U.S. Policy*, science teachers may find a place for the unit in their classrooms as well. Below are a few ideas about where *Global Environmental Problems: Implications for U.S. Policy* might fit into your curriculum.

The Role of the International Community: Global environmental problems are at the forefront of an emerging set of international issues that transcend national borders. Along with refugee crises, nuclear proliferation, AIDS, drug trafficking, and terrorism, global environmental problems have redefined the agenda of the international community in recent decades. They have also focused renewed attention on the role of the United Nations (UN) and other international organizations. As the UN enters its second half-century, Americans are often ambivalent about our country's relationship with the global body. On the one hand, the threat of global environmental problems and other transnational issues has elevated the importance of international cooperation. On the other hand, many Americans fear that expanding the UN's authority will infringe on our country's sovereignty and create a new layer of bureaucratic red tape. *Global Environmental Problems: Implications for U.S. Policy* offers an opportunity to examine these issues in the classroom.

Economics and the Environment: Since the first agricultural societies took hold, humanity has struggled to balance its economic needs with the health of the natural environment. History shows that even in ancient times short-sighted irrigation practices and overgrazing led to the degradation of the land in Mesopotamia, Egypt, and other fertile river valleys. Today, environmental concerns have entered into the study of modern economic systems. The dangers of global warming, ozone depletion, and other environmental problems are often seen as limits to economic growth. Environmentalists have put forth their own economic models for sustainable development. Others view environmental problems as challenges that are likely to spur innovation and new technology. For high school students, the integration of global environmental problems into our thinking about economics adds a new dimension to social studies and science.

The Industrial Revolution: The global environmental problems that we face today are an outgrowth of the Industrial Revolution that began more than two centuries ago in Britain. As industrialization spread across Europe, North America, and Japan in the 19th century, there were few voices raised on behalf of environmental protection. Widespread concern about pollution in the United States did not emerge until after World War II. Suggestions that industrialization may be linked to long-term climatic change or depletion of the ozone layer were hardly considered. With the pace of industrialization today gathering steam in much of the developing world, scientists are increasingly concerned about the environmental consequences. *Global Environmental Problems: Implications for U.S. Policy* invites a comparison between the Industrial Revolution that took place in the West and Japan and the ongoing development in the newly industrializing countries of East Asia and Latin America.

Defining Global Environmental Problems

Objectives:

Students will:

- Define the concept of global environmental problems.
- Analyze the global environmental problems that have resulted from the development of the Amazon Basin.
- Weigh the challenges and trade-offs involved in protecting the global environment.

Handouts:

- "Exploring the Rainforest" (page 4).

In the Classroom:

1. Distinguishing Global Environmental Problems — Call on students to offer examples of "environmental problems." List the most frequently cited examples on the chalkboard and ask students to identify the problems that are mostly closely connected to their community.

2. Exploring the Rainforest — Distribute "Exploring the Rainforest" and instruct students to quickly read the article. Do the issues discussed in the article fit their understanding of environmental problems? Why is the fate of the South American rainforest considered a "global" environmental problem? Ask students to identify other global environmental problems. Why has the concept of global environmental problems emerged only in the last few decades?

3. Weighing Political Considerations — Note that many scientists argue that the rainforest ecosystem should be considered a trust of humanity, similar to the status of Antarctica and the oceans. Does this sentiment conflict with our notion of national sovereignty? Point out that American settlers chopped down millions of acres of forest and nearly hunted the buffalo to extinction without receiving criticism from abroad. In light of our past, do we have the right to protest the actions of people in South American countries? How does the United States contribute to the destruction of the rainforest (e.g., role of American transnational corporations, demand in the United States for wood, beef, and other agricultural products, etc.)? What role should the United States play in addressing this issue?

Homework:

Students should read Parts I and II of the background reading and complete "Study Guide — Parts I and II."

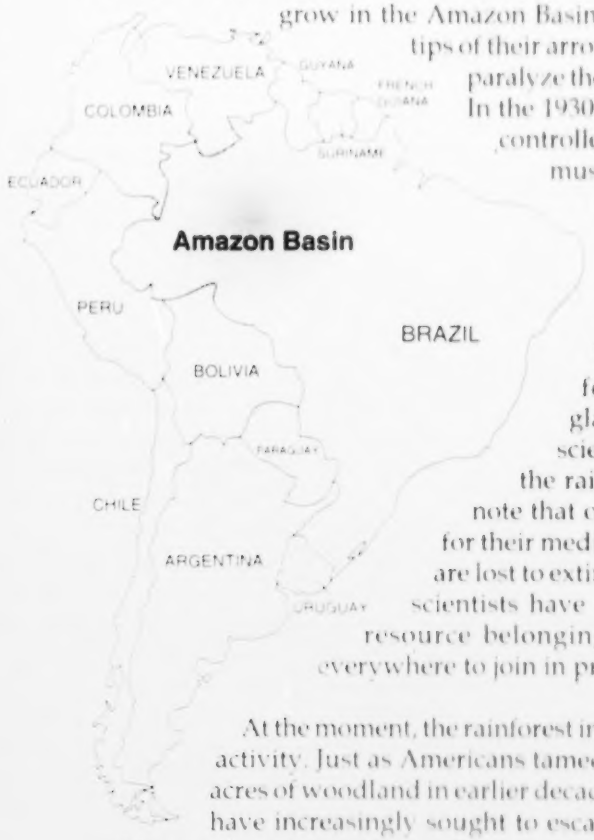
Exploring the Rainforest

In the Amazon River basin of South America, farmers, loggers, and cattle ranchers are rapidly clearing away the tropical rainforests that cover much of the land along the equator.

In hospitals throughout the world, d-tubocurarine serves as the basis for drugs that are used thousands of times daily to relax muscles without deep anesthesia during surgery and to treat multiple sclerosis, Parkinson's disease, and other muscular disorders.

How are South American rainforests and health care related? The answer provides an introduction to a complex set of issues known as global environmental problems.

D-tubocurarine is derived from curare — a dried extract of the bark and stems of plants that grow in the Amazon Basin. South American Indians have long poisoned the tips of their arrows with curare. In large doses, curare poisoning can paralyze the muscles of the respiratory system and lead to death. In the 1930s and 1940s, however, scientists demonstrated that controlled amounts of curare could be used as a temporary muscle relaxant. D-tubocurarine and later generations of drugs derived from curare have been highly valued as an anesthetic that does not produce harmful side-effects.



There are eighteen drugs currently used just in the United States that are obtained directly from tropical forest plants, including treatments for malaria, glaucoma, Hodgkin's disease, and leukemia. Many scientists believe that the pharmaceutical potential of the rainforests is enormous, and largely untapped. They note that only 1 percent of rainforest plants have been tested for their medicinal value. Of course, once rare plants and animals are lost to extinction they are lost forever. For those reasons, many scientists have urged world leaders to view the rainforests as a resource belonging to all of humanity. They want governments everywhere to join in preserving the rainforests for future generations.

At the moment, the rainforest in much of South America is under threat from human activity. Just as Americans tamed the frontier in our country by clearing millions of acres of woodland in earlier decades, people in Brazil, Venezuela, and other countries have increasingly sought to escape the poverty of overcrowded coastal regions by settling in the Amazon Basin. Every year, an area of rainforest the size of New York state is destroyed or severely damaged. Experts estimate that worldwide half the rainforest has been destroyed in the past forty years.

As Americans, what does this mean for us?

Global Environmental Problems in the International Arena

Objectives:

Students will:

- Compare environmental concerns in four distinct regions of the world.
- Articulate international viewpoints in a collaborative role-play setting.
- Assess the prospects for international consensus on global environmental problems.

Required Reading:

Students should have read Parts I and II of the background reading and completed "Study Guide — Parts I and II."

In the Classroom:

1. Creating Small Groups — Divide the class into four groups. Explain that students will represent different regions of the world participating in the UN Commission on Sustainable Development (UNCSD), a body created to follow up the work of the Earth Summit held in June 1992. Note that the main task of UNCSD is to implement Agenda 21, a non-binding, 800-page set of guidelines adopted by Earth Summit delegates to balance the needs of economic development and environmental protection.

2. Defining Roles — Assign each group one of four regions: the developed world; the former Soviet bloc countries; the newly industrializing countries; or the underdeveloped world. Instruct each group to formulate a brief presentation on the environmental problems and concerns of its region. For example, representatives of the newly industrializing countries should note that their people are beginning to suffer from the ill effects of industrial pollution and rapid urbanization. At the same time, they would be wary of environmental restrictions that would hamper their development and deny their people an opportunity to reach a standard of living comparable to that of the developed world. Students should base their presentations on the "Dilemmas of Economic Development" section, pages 7-9, in Part II of the background reading. A review of the location of the major countries in each region may also be useful.

3. Acquiring a Global Perspective — Instruct each group to select one member to record the ideas of the group and another to deliver the presentation. After the groups have given their presentations, ask students to analyze the viewpoints of the four regions. What are the major points of contention? How is the United States perceived within each region? What is the likelihood of global consensus on environmental issues?

Homework:

Students should read Part III of the background reading and complete "Study Guide — Part III."

Name:

Study Guide — Parts I and II

Global Environmental Problems/Humanity's Impact on the Environment

1. Summarize the causes and effects of each of the following problems.

Global warming:

Ozone depletion:

Acid rain:

Deforestation and desertification:

Decline of biodiversity:

2. Why are most global environmental problems linked to energy use?

3. Summarize how people in the four major regions of the world view environmental problems.

Developed world:

Former Soviet bloc:

Newly industrializing countries:

Underdeveloped world:

Understanding the Carbon Cycle

Objectives:

Students will:

- Identify the key components of the global carbon cycle.
- Assess humanity's impact on the carbon cycle through an analysis of graphs and tables.
- Weigh the policy implications of humanity's contributions to increased concentrations of atmospheric carbon dioxide.

Required Reading:

Students should have read "Optional Reading: Following the Path of the Carbon Cycle" and completed the accompanying study guide.

Handouts:

- "Humanity's Impact on the Carbon Cycle" (pages 9-10).

In the Classroom:

1. Reviewing Scientific Concepts — Call on students to identify the most important scientific concepts related to the carbon cycle. Ask them to explain how the concepts are addressed in the study guide questions.

2. Analyzing Data — Distribute "Humanity's Impact on the Carbon Cycle" and review the five sets of data with the class. Call on students to answer the questions associated with each graph or table. How are the questions related to the scientific concepts raised in the optional reading? How does each data set translate into challenges for national governments worldwide? What is the significance of the U.S. contribution to the increase in anthropogenic carbon dioxide emissions? What steps could the United States take to reduce our country's emissions?

3. Policy Implications — Ask students to imagine that they are participating in an international conference on global warming. Based on the data before them, what policy recommendations would they make? What additional data would be useful for developing policy? Which data would receive the most emphasis from representatives of developed countries? What about representatives of developing countries?

Name:

Study Guide

Optional Reading: Following the Path of the Carbon Cycle

1. How are the processes of photosynthesis and respiration related to the carbon cycle?

2. Why is the atmosphere considered the "buffer" of the carbon cycle?

3. How is the oceanic process of carbon dioxide absorption related to the expectation that atmospheric carbon dioxide concentrations will probably rise for at least two centuries?

4. Summarize humanity's impact on the carbon cycle.

   a. anthropogenic carbon sources:

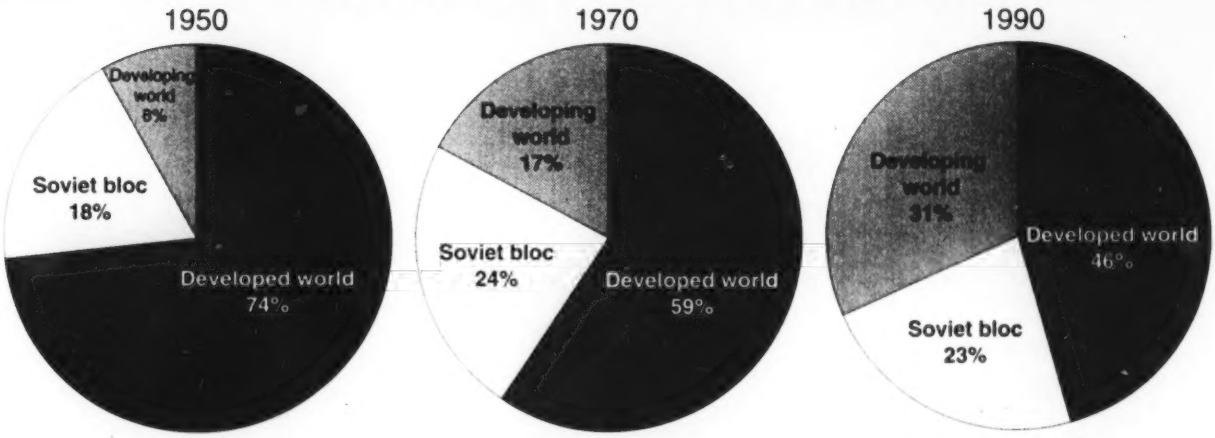
   b. anthropogenic carbon sinks:

5. How does the current level of atmospheric carbon dioxide compare to past concentrations? How are scientists able to compare current carbon dioxide concentrations with past levels?

6. How would the "climate feedback" brought on by global warming likely affect the carbon cycle?

Humanity's Impact on the Carbon Cycle

Data Set #1: Carbon Dioxide Emissions by Region



Total: 1586 MtCs* Total: 3860 MtCs Total: 6098 MtCs

*1 MtC = 1 million tonnes, or megaton, of carbon.

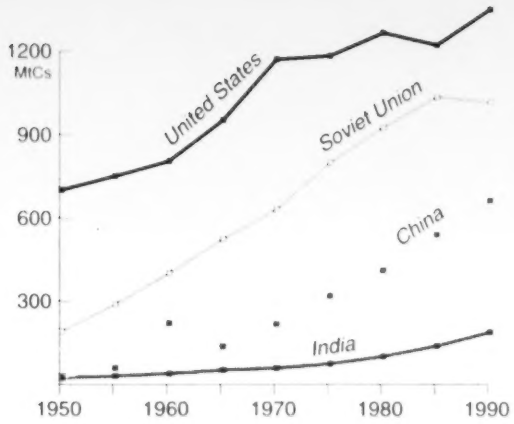
Although the developed world and the former Soviet bloc presently account for about two-thirds of global atmospheric carbon dioxide emissions, the share of the developing world has risen rapidly. What factors account for the changing proportions? What do you expect the balance to be in 2010?

Data Set #2: Carbon Dioxide Emissions by Source (in MtC/yr)

	Coal and other Solid Fuels	Oil and other Liquid Fuels	Natural Gas	Cement Production	Total
1860	93	0	0	No data	93
1880	224	3	0	No data	227
1900	505	16	4	No data	525
1920	870	76	13	No data	959
1940	1033	225	43	No data	1300
1960	1419	889	235	43	2586
1980	1950	2496	726	120	5292
1990	2393	2544	1004	157	6098

Fossil fuels are responsible for about 80 percent of anthropogenic carbon dioxide emissions. How has the balance of energy sources changed since 1860? How high will the atmospheric concentration of carbon dioxide climb if annual emissions rise by 2,000 MtCs in the next decade? How have scientists used carbon isotopes to determine that fossil fuels have led to a build-up in atmospheric carbon dioxide?

Data Sources: *Trends '91: A Compendium of Data, Policy Implications of Greenhouse Warming*, and *Global Warming: The Greenpeace Report*.

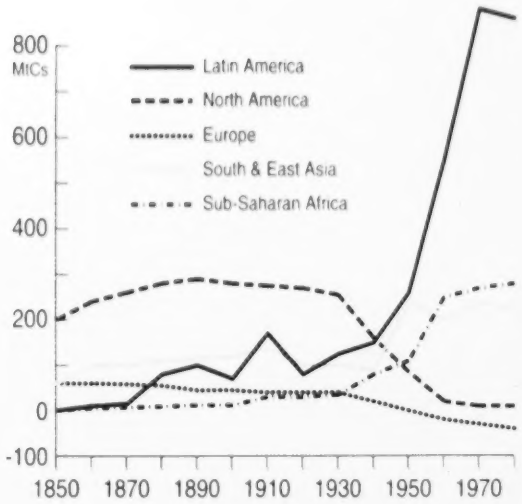


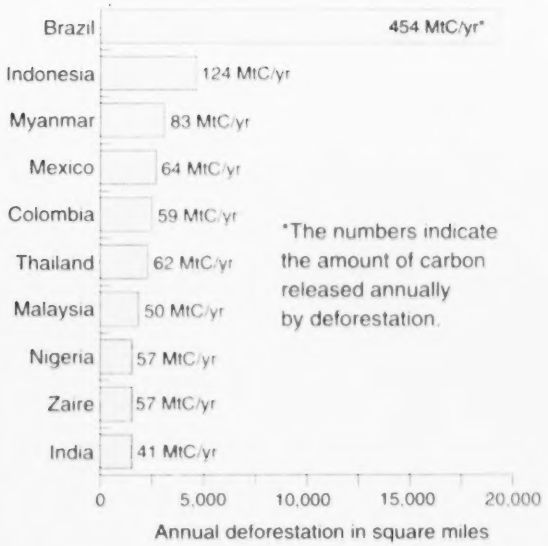
Data Set #3: Carbon Dioxide Emissions from Key Producers

The United States and the former Soviet Union have long been the leading emitters of carbon dioxide, but China is now closing the gap. Why will China's energy policy have a particularly significant impact on global atmospheric carbon dioxide concentrations in the future? Why has the United States failed to reduce its carbon dioxide emissions in recent years?

Data Set #4: Annual Net Carbon Emissions to the Atmosphere Due to Land Use Changes

Changes in land use, mostly in the developing world, account for about 20 percent of global atmospheric carbon dioxide emissions. Why are forests a vital sink of carbon dioxide? How have fossil fuel emissions possibly contributed to forest regrowth in the Northern Hemisphere? How would forests likely be affected by the climate feedback of global warming?





Data Set #5: Leading Contributors to Deforestation and Carbon Release

Deforestation in the developing world is typically connected to population growth, the spread of agriculture, and industrial development. What are the factors contributing to deforestation in each of the ten countries featured in the graph? For example, what accounts for the differences in deforestation rates between Brazil and India? How do American consumers contribute to deforestation in the developing world?

Role Playing the Four Options: Organization and Preparation

Objectives:

Students will:

- Analyze the issues that frame the debate on U.S. global environmental policy.
- Identify the core underlying values of the options.
- Integrate the arguments and beliefs of the options and the background reading into a persuasive, coherent presentation.
- Work cooperatively within groups to organize effective presentations.

Required Reading:

Students should have read Part III of the background reading and completed "Study Guide — Part III."

Handouts:

- "Presenting Your Option" (page 13) for option groups.
- "Expressing Key Values" (page 14) for option groups.
- "Presidential Advisory Panel Members" (page 15) for panel members.

In the Classroom:

1. Planning for Group Work — In order to save time in the classroom, form student groups before beginning Day Three. During the class period of Day Three, students will be preparing for the Day Four simulation. Remind them to incorporate the background reading into the development of their presentations and questions.

2a. Option Groups — Form four groups of four students. Assign an option to each group. Distribute "Presenting Your Option" to the four option groups. Inform students that each option group will be called upon in Day Four to present the case for its assigned option to an advisory panel formed to counsel the president on U.S. policy toward global environmental problems. Explain that option groups should follow the instructions in "Presenting Your Option." Note that the option groups should begin by assigning each member a role.

2b. Advisory Panel Members — The remainder of the class will serve as members of the presidential advisory panel. Distribute "Presidential Advisory Panel Members" to each commission member. While the option groups are preparing their presentations, members of the advisory panel should develop cross-examination questions for Day Four. (See "Presidential Advisory Panel Members.") Remind panel members that they are expected to turn in their questions at the end of the simulation.

Suggestions:

In smaller classes, other teachers or administrators may be invited to serve as members of the advisory panel. In larger classes, additional roles — such as those of newspaper reporter or lobbyist — may be assigned to students.

Extra Challenge:

Ask the option groups to design a poster or a political cartoon illustrating the best case for their options.

Homework:

Students should complete preparations for the simulation.

Day 3

Name:

Study Guide — Part III
Environmental Issues on the International Agenda

1. How did the "North-South divide" influence the outcome of the Earth Summit?

2. How have North-South divisions complicated efforts to protect the ozone layer?

3. How are corporations from the developed world linked to pollution problems in poor countries?

4. Explain how changes in U.S. tax policy could serve to reduce global warming.

5. Why are measures taken in the name of environmental protection often opposed by critics of big government?

6. How has President Clinton's position on environmental policy differed from the position of President Bush?

Presenting Your Option

Preparing Your Presentation

Your Assignment: Your group has been called upon to appear before a panel that will advise the president on U.S. global environmental policy. Your assignment is to persuade panel members that your option should be the basis for U.S. policy. You will be judged on how well you present your option.

Organizing Your Group: Each member of your group will take a specific role. Below is a brief explanation of the responsibilities for each role.

1. *Spokesperson:* Your job is to explain the option of your group to the presidential advisory panel in a three-to-five minute presentation. In preparing your presentation, you will receive help from the other members of your group. You should include arguments from their areas of expertise. Keep in mind, though, that you are expected to take the lead in organizing your group. Read your option and review the background reading to build a strong case for your option. The "Expressing Key Values" worksheet will help you organize your thoughts.

2. *Environmental Scientist:* Your job is to advise the spokesperson of your group on why your option is scientifically sound. Carefully read your option, and then review Part I (pages 1-4) of the background reading and the "Energy and the Environment" section of Part II (pages 5-7). Make sure that your area of expertise is reflected in the presentation of your group spokesperson. The "Expressing Key Values" worksheet will help you organize your thoughts.

3. *Domestic Policy Analyst:* Your job is to advise the spokesperson of your group on how the policies of your option would address problems here at home. You should concentrate on assessing the effects of your option on our country's environment and economy. Carefully read your option, and then review pages 12-15 of Part III of the background reading, beginning with "Determining U.S. Policy." Make sure that your area of expertise is reflected in the presentation of your group spokesperson. The "Expressing Key Values" worksheet will help you organize your thoughts.

4. *Foreign Policy Analyst:* Your job is to advise the spokesperson of your group on how your option would serve our country's foreign policy interests. Carefully read your option, and then review the "Dilemmas of Economic Development" section of Part II (pages 7-9) of the background reading and "The North-South Divide" section of Part III (pages 10-12). Make sure that your area of expertise is reflected in the presentation of your group spokesperson. The "Expressing Key Values" worksheet will help you organize your thoughts.

Making Your Case

After your preparations are completed, your spokesperson will deliver a three-to-five minute presentation to the presidential advisory panel. The "Expressing Key Values" worksheet and other notes may be used, but the spokesperson should speak clearly and convincingly. During the other presentations, you should try to identify the weak points of the competing options. After all of the groups have presented their options, members of the advisory panel will ask you cross-examination questions. Any member of your group may respond during the cross-examination period.

Name:

Expressing Key Values

The notion of values lies at the core of this unit. Each of the four options in this unit revolves around a distinct set of values. The opening two paragraphs of your option are devoted to making a convincing case for the values that are represented. The term "values," however, is not easy to define. Most often, we think of values in connection with our personal lives. Our attitudes toward our families, friends, and communities are a reflection of our personal values.

Values play a critical role in our civic life as well. In the United States, our country's political system and foreign policy have been shaped by a wide range of values. The high value many Americans place on freedom, democracy, and individual liberty rings loudly throughout U.S. history. For most of our country's existence, the impulse to spread American values beyond our borders was outweighed by the desire to remain independent of foreign entanglements. Since World War II, however, the United States has played a larger role in world affairs than any other nation. At times, American leaders have emphasized the values of international cooperation and shared responsibility. On other occasions, the values of independence and economic security have been stressed. Many of these values have entered into the debate on global environmental policy.

Some values fit together well. Others are in conflict. Americans are constantly being forced to choose among competing values in our ongoing discussion of public policy. Your job is to identify and explain the most important values underlying your option. These values should be clearly expressed by every member of your group. This worksheet will help you organize your thoughts.

1. What are the two most important values underlying your option?

   a.

   b.

2. According to the values of your option, what should be the role of the United States in the world?

3. Why should the values of your option serve as the basis for our country's global environmental policy?

Presidential Advisory Panel Members
Hearing on Global Environmental Policy

Your Role

You have been appointed to serve on a select panel that advises the president on global environmental policy. As you know, scientists in the past few decades have come to recognize that a new set of environmental concerns, including global warming and the depletion of the ozone layer, affect the entire planet. Increasingly, global environmental problems have entered the arena of international relations and have emerged as a subject of debate here at home. These hearings will introduce you to four distinct approaches for U.S. policy on this issue.

Your Assignment

While the four option groups are organizing their presentations, you should prepare two questions regarding each of the options. Your teacher will collect these questions at the end of Day Four.

Your questions should be challenging and critical. For example, a good question for Option 1 might be:

If the United States adopts Option 1, how would our relations with Western Europe and Japan be affected?

On Day Four, the four option groups will present their positions. After the presentations are completed, your teacher will call on you and your fellow panel members to ask questions. The "Evaluation Form" you receive is designed for you to record your impressions of the option groups. Part I should be filled out in class after the option groups make their presentations. Part II should be completed as homework. After this activity is concluded, you may be called upon to explain your evaluation of the option groups.

Role Playing the Four Options: Debate and Discussion

Objectives:

Students will:

- Articulate the leading values that frame the debate on U.S. global environmental policy.
- Explore, debate, and evaluate multiple perspectives on U.S. global environmental policy.
- Sharpen rhetorical skills through debate and discussion.
- Cooperate with classmates in staging a persuasive presentation.

Handouts:

- "Evaluation Form" (page 17) for panel members.

In the Classroom:

1. Setting the Stage — Organize the room so that the four option groups face a row of desks reserved for the presidential advisory panel. Distribute "Evaluation Form" to the advisory panel members. Instruct members of the panel to fill out the first part of their "Evaluation Form" during the course of the period. The second part of the worksheet should be completed as homework.

2. Managing the Simulation — Explain that the simulation will begin with three-to-five minute presentations by the spokespersons for the option groups. Encourage the spokespersons to speak clearly and convincingly.

3. Guiding Discussion — Following the presentations, invite members of the presidential advisory panel to ask cross-examination questions. Make sure that each panel member has an opportunity to ask at least one question. The questions should be evenly distributed among all four option groups. If time permits, encourage members of the option groups to challenge the positions of the other groups. During cross-examination, allow any option group member to respond. (As an alternative approach, permit cross-examination after the presentation of each option.)

Homework:

Students should read each of the four options, then moving beyond these options they should fill out "Focusing Your Thoughts," and complete "Your Option Five."

Evaluation Form
Presidential Advisory Panel Members

Part I

What was the most persuasive argument presented in favor of this option?	What was the most persuasive argument presented against this option?
Option 1	*Option 1*
Option 2	*Option 2*
Option 3	*Option 3*
Option 4	*Option 4*

Part II

Which group presented its option most effectively? Explain your answer.

Looking into the Future

Objectives:

Students will:

- Articulate coherent recommendations for U.S. global environmental policy based on personally held values.
- Weigh the long-term consequences of individual policy recommendations.
- Integrate policy options and beliefs into a personalized letter.

Required Reading:

Students should have read the four options, and completed "Focusing Your Thoughts" and "Your Option Five."

In the Classroom:

1. Expressing Values — Call on members of the presidential advisory panel to share their evaluations of the option groups. Which arguments were most convincing? Which beliefs were most appealing? Review the beliefs in "Focusing Your Thoughts," noting the relationship between beliefs and options. Call on students to explain how their beliefs guided their responses in "Your Option Five."

2. Drafting a Letter — Inform students that they will be using their responses to "Your Option Five" as the basis for writing a letter projected one generation into the future. Students should imagine that the recipients of the letters are their own teenage children. They should also assume that their children share many of the questions they have today about environmental issues. The opening salutation should be addressed "Dear Son/Daughter." Instruct students to begin the letter by summarizing the beliefs and policies of their options. In the conclusion of their letter, they should explain how their proposed options will result in a better life for the next generation. If time permits, invite students to share their letters with the class.

Suggestions:

Students may be given the choice of working individually or in pairs.

Extra Challenge:

As homework, instruct students to write a letter based on their option to the editor of a local newspaper, a member of Congress, or the president. Suggest that students incorporate current issues into their letters.

Encourage students to explore the local dimension of global environmental issues. For example, how will U.S. efforts to reduce the emission of greenhouse gases and ozone-depleting chemicals affect the local environment and economy? Have local businesses developed new products and services to reduce pollution? Suggest that students contact organizations that have sought to make their voices heard in the debate on environmental issues. Many community-based environmental groups maintain ties to national advocacy organizations. Major corporations, especially those involved in the energy business, also are active in environmental issues.

Focusing Your Thoughts

Instructions: You have had an opportunity to consider four options on U.S. global environmental policy. Now it is your turn to look at each of the options from your own perspective. Try each one on for size. Think about how the options address your concerns and hopes. You will find that each has its own risks and trade-offs, advantages and disadvantages. After you complete this worksheet, you will be asked to develop your own option on this issue.

Ranking the Options

Which of the options below do you prefer? Keep in mind that the beliefs you support most strongly should guide your choice. Rank the options, with "1" being the best option for the United States to follow.

___ **Option 1: Putting the Economy First**

___ **Option 2: Taking the Lead**

___ **Option 3: Sharing Environmental Leadership**

___ **Option 4: Global Stewardship**

Beliefs

Considering the statements below will help you answer the first three questions of "Your Option Five." Rate each of them according to your personal beliefs:

1 = Strongly Support
2 = Support
3 = Oppose
4 = Strongly Oppose
5 = Undecided

___ To solve global problems, rich and poor countries must work together.

___ As the most powerful nation in the world, the United States is capable of addressing international problems without relying on other countries.

___ The United States should not allow other countries to shape policies that affect the lives of Americans.

___ Countries that are poor and technologically backward have only themselves to blame.

___ The United States has a responsibility to share science and technology to help solve the most pressing problems in poor countries.

___ The health of the U.S. economy has a greater impact on the lives of Americans than any other issue.

___ The United States needs the help of Western Europe and Japan to deal with international problems.

___ Poverty, lack of development, and corruption have left many poor countries unable to cope with critical problems within their borders.

___ In our competitive world, the United States cannot afford to give up any advantage in science and technology.

___ Americans today need to make sacrifices in their way of life to safeguard the world for future generations.

Creating Your Own Option

Your next assignment is to create an option that reflects your own beliefs and opinions. You may borrow heavily from one option, or you may combine ideas from two or three options. Or you may take a new approach altogether. There are, of course, no perfect solutions. And there is no right or wrong answer. Rather, you should strive to craft an option that is logical and persuasive. Be careful of contradictions. For example, we should not offer to share our technology with other countries if our goal is to take the lead in industries that protect the environment.

Name:

Your Option Five

Instructions: In this exercise, you will offer your own recommendations for U.S. global environmental policy. Your responses to "Focusing Your Thoughts" should help you identify the values of your proposal.

1. How important are environmental problems compared to other problems facing the United States?

2. Which parts of the world pose the greatest threat to the global environment?

3. What changes, if any, should the United States make in its relations with other countries in response to environmental problems?

4. Summarize the option you think the United States should adopt regarding global environmental policy.

5. What are the two strongest arguments opposing your option?

   a.

   b.

6. What are the two strongest arguments supporting your option?

   a.

   b.

Alternative Three-Day Lesson Plan

Day 1: See Day One of the Suggested Five-Day Lesson Plan. Students should read Parts I and II of the background reading and complete "Study Guide — Parts I and II."

Day 2: Assign each student one of the four options, and allow a few minutes for students to familiarize themselves with the mindsets of the options. Call on students to evaluate the benefits and trade-offs of their assigned options. How do the options differ in their assumptions about the relative importance of global environmental problems? How would the U.S. role in the world change according to the recommendations of the options? Moving beyond the options, ask students to imagine that they have been called upon to advise the president on U.S. global environmental policy. What concerns would be at the top of their agenda? Which values should guide the direction of U.S. global environmental policy?
Homework: Students should complete "Focusing Your Thoughts" and "Your Option Five."

Day 3: See Day Five of the Suggested Five-Day Lesson Plan.

The contents of this unit are being distributed under a grant from the U.S. Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government. If an education service provider uses funds under a program subject to section 439 of the General Education Provisions Act (GEPA) (20 U.S.C. 1232h) to adopt this project, the education service provider must comply with part 98 of title 34 of the Code of Federal Regulations (Student Rights in Research, Experimental Programs and Testing) which contains the regulations implementing that section of GEPA.

Making Choices Work in Your Classroom

Like the art of cooking, cooperative group learning is a skill that is rarely perfected on the first attempt, either by teachers or students. Yet with careful preparation, guidance, and practice significant gains can be made quickly. No single recipe guarantees success with cooperative learning or the Choices approach in every classroom. That would be impossible, since each classroom differs in its organization and size, and its unique collection of personalities and needs. However, this section of the Teacher's Resource Book offers a variety of ingredients for teachers to use as they adapt Choices curricula to their classrooms. The suggested ingredients that follow have been drawn from educational research on student-centered instruction and, more important, from the experiences of teachers who have used Choices curricula successfully in their classrooms over the past six years. Educators who have questions about using Choices curricula in their classrooms are encouraged to contact the Choices Education Project in writing, or by calling (401) 863-3155. The Choices staff includes experienced classroom teachers who will be pleased to speak with you.

Designing Cooperative Learning Groups

Group Size: The key to successful cooperative group work is having a group assignment that is complex enough to require the participation of all group members. Planning the size and composition of working groups in advance is crucial to the successful use of Choices curricula. Research indicates that the ideal size for a cooperative learning group is four or five students. This is certainly the ideal size for group assignments in Choices units. When using Choices units in larger classes, the size of option (or, in the case of this unit, Future) groups may be expanded to six or seven students. However, it is important to keep in mind that whenever the number of students in a group is increased, the number of roles and expected outcomes must also be expanded.

Group Composition: A strength of cooperative learning is that it creates opportunities for students to work together in new combinations on challenging tasks. Cooperative learning not only requires the academic skills of reading, writing, and critical thinking, but the interpersonal skills of communication, negotiation, and problem-solving. In most cases, this style of instruction and learning is most effective when students are assigned to groups by the teacher rather than being allowed to work with their friends. While random group selection can be effective, in most classes successful group composition requires that the teacher consider the personalities, strengths, and needs of the students.

Groups comprised of students with diverse strengths, talents, and needs are ideal. For example, artistic students might be assigned to different groups to share their talents and perspectives, while less verbal students could be placed in groups with more outgoing students to help draw them into the lesson. Whenever possible, teachers should try to prevent one student from dominating a group. Explaining the instructions, roles, and ground rules for cooperative learning (see below) helps prevent this. Teachers may choose to group aggressive students with each other, leaving room in other groups for less assertive students to emerge as leaders. Finally, even though the negotiation of roles among the students in a group can be a valuable part of the cooperative learning experience, teachers might choose to assign certain roles, such as group spokesperson, in order to encourage leadership from more reticent students and to keep more aggressive students from dominating.

Students may initially complain about being assigned to groups that do not include their closest friends. We have found that, at the conclusion of the assignment, they will usually express satisfaction with their assigned partners, recognize that they got more accomplished, and sometimes even acknowledge the start of new friendships. The additional time involved in planning group size and composition will pay off when students are actively engaged, debating, and thinking critically.

Preparing Students for Cooperative Learning

Provide Clear Written Instructions: As with any assignment, students benefit from instructions and guidelines that clearly outline expectations and how they will be accomplished. These should be given to students in writing and reviewed with the class. Afterwards, as questions arise within groups, students should refer to the written instructions and attempt to answer each other's questions before asking for the teacher's assistance.

Establish Ground Rules: Especially when cooperative learning is a new experience, students benefit from the establishment of ground rules that are explained before groups are formed. Ground rules must be kept simple, and should be designed to keep students involved and on task. Posting these rules in a prominent place in the classroom can be very effective. An example of simple but effective ground rules for the cooperative group assignments could be:

Everybody has a role (or a job)
Everybody participates
Nobody dominates
Nobody interrupts

These rules can be enforced by appointing one student to serve as the group manager. The teacher can make it clear that one of the group manager's responsibilities is to enforce the ground rules as the group explores its assigned option and prepares its presentation. The group manager might also be required to make sure that members of the group stay on task and attempt to solve problems before asking for the teacher's assistance. Ground rules that are clear and used consistently can, over time, become an integral component of the classroom, facilitating learning and keeping students on task.

Managing the Choices Simulation

Recognize Time Limitations: At the heart of the Choices approach is the role-play simulation in which students advocate different options, question each other, and debate. Just as thoughtful preparation is necessary to set the stage for cooperative group learning, careful planning for the presentations and debate can increase the effectiveness of the simulation. Time is the essential ingredient to keep in mind. A minimum of 45 to 50 minutes is necessary for the presentations and debate. Hence, if only one class period is available, student groups must be ready as soon as class begins. Teachers who have been able to schedule a double period or extend the length of class to one hour report that the extra time is beneficial. When necessary, the role-play simulation can be run over two days, but this disrupts the momentum of the debate. The best strategy for managing the role-play is to establish and enforce strict time limits, such as five minutes for each option presentation, ten minutes for questions and challenges, and the final five minutes of class for wrapping up the debate. It is crucial to make students aware of strict time limits as they prepare their presentations.

Highlight the Importance of Values: During the debate and debriefing, it is important to highlight the role of values in the options. Students should be instructed to identify the core values and priorities underlying the different options.

Moving Beyond the Options

As a culminating activity of a Choices unit, students are expected to articulate their own views of the issue under consideration. An effective way to move beyond the options debate to creating individual options is to have students consider which values in the options framework they hold most dear. Typically, students will hold several of these values simultaneously and will need to prioritize them to reach a considered judgment about the issue at hand. These values should be reflected in their own options and should shape the goals and policies they advocate.

Adjusting for Large and Small Classes

Choices units are designed for an average class of twenty-five students. In larger classes, additional roles, such as those of newspaper reporter or member of a special interest group, can be assigned to increase student participation in the simulation. With larger option groups, additional tasks might be to create a poster, political cartoon, or public service announcement that represents the viewpoint of an option. In smaller classes, the teacher can serve as the moderator of the debate, and administrators, parents, or faculty can be invited to play the roles of congressional leaders. Another alternative is to combine two small classes.

Applying Choices to Ability-Grouped Classes

Choices curricula are developed with the majority of high school students in mind. Choices units are not designed solely for students in honors or advanced placement programs. Nor are they designed specifically for students in remedial classes. However, the units are designed to be flexible enough for high school teachers to adapt for *any* classroom, and they have been used successfully in all kinds of classes. The Choices staff places confidence in the ability of teachers to decide which units are best suited for the courses and students they teach. The following suggestions may assist teachers of higher- and lower-ability classes in adapting Choices curricula to meet the needs of their students.

Lower-Ability Classes: It would be a mistake to believe that the Choices approach is too difficult for students in lower-ability classes. Teachers report that, with certain adaptations, Choices units can motivate higher levels of student participation, thinking, and confidence in lower-ability classes. Feedback from classroom teachers indicates that the following strategies lead to success with Choices in these classes:

- Maintain high expectations for student learning and thinking.
- Classes of all abilities do a better job with Choices the second or third time the approach is used. Skills in collaboration, communication, and critical thinking improve with practice.
- Some units are easier than others because the necessary background is particularly accessible. Use one of these first to give the students some experience with the approach.
- To make background readings more manageable, some teachers have students read aloud in class, stopping to discuss or clarify key points. Other teachers substitute shorter readings from the textbook or another source as background reading.
- Key concepts from the background can be explained in a mini-lecture format.
- Students can review and keep track of the important terms in a unit by creating their own glossary for reference throughout the unit.
- An extra day for review of the background, for group preparation, or for the development of individual options can be very worthwhile.

Higher-Ability Classes: Choices units have much to offer students in higher-ability and advanced placement classes. Students are challenged to understand the internal logic of different arguments and to extrapolate from these while playing the role of advocate. Two-week Choices units are especially rich in historical background, and they highlight the complex relationships among nations through many eras. Choices units on historical topics typically include a wealth of primary source documents for students to read and analyze. These documents can help to prepare students in advanced placement classes for the "Document Based Questions" included on advanced placement examinations. Extra challenge assignments are included in many lesson plans, and every Choices unit includes suggestions for additional reading and research.

Assessing Student Achievement

Grading Group Assignments: Research suggests that it is counterproductive to give students individual grades on cooperative group assignments. A significant part of the assignment given to the group is to cooperate in achieving a common goal, as opposed to looking out for individual interests. Telling students in advance that the group will receive one grade often motivates group members to hold each other accountable. This can foster group cohesion and lead to better group results. It may be useful to note that in addition to the cooperative group assignments, students complete individual assignments as well in every Choices unit.

Requiring Self-Evaluation: Having students complete self-evaluations is an extremely effective way to make them think about their own learning. Self-evaluations can take many forms and are useful in a variety of circumstances. They are particularly helpful in getting students to think constructively about group collaboration. In developing a self-evaluation tool for students, teachers need to pose clear and direct questions to students. A sample Group Project Self-Evaluation is included on the following page. Each student should complete his/her own evaluation as part of the unit. Two key benefits of student self-evaluation are that it involves students in the assessment process, and that it provides teachers with valuable insights into the contributions of individual students and the dynamics of different groups. These insights can help teachers to organize groups for future cooperative assignments.

Evaluating Student Options: The most important outcomes of a Choices unit are the original options developed and articulated by each student. These will differ significantly from one another, as students identify different values and priorities that shape their viewpoints. These options cannot be graded as right or wrong, but should be evaluated on clarity of expression, logic, and thoroughness. Did the student provide reasons for his/her viewpoint along with supporting evidence? Were the values clear and consistent throughout the option? Did the student identify the risks involved? Did the student present his/her option in a convincing manner?

Testing: In a formal evaluation of the Choices approach, it was demonstrated that students using Choices learned the factual information presented as well as or better than students who were taught in a more traditional lecture-discussion format. However, the larger benefits of the Choices approach were evident when students using Choices demonstrated significantly higher ability to think critically, analyze multiple perspectives, and articulate original viewpoints, compared to students who did not use this approach. Teachers should hold students accountable for learning historical information, concepts, and current events presented in Choices units. However, a simple multiple-choice examination will not allow students to demonstrate the critical thinking and communication skills developed through the Choices unit. If teachers choose to test students, they may wish to explore new models of test design that require students to do more than recognize correct answers. Tests should not replace the development of student options.

For Further Reading: Cohen, Elizabeth G. *Designing Groupwork: Strategies for the Heterogeneous Classroom* (New York: Teachers College Press, 1986).

Group Project Self-Evaluation

1. What did you contribute to this project?

2. List the names of your partners and briefly comment on each person's contributions.

3. What things went well within your group?

4. What problems did you encounter? How did you attempt to resolve these problems?

5. If you had this assignment to do over again, with the same partners, what would you do differently?

6. Overall, what grade do you think your group deserves on this assignment? Explain your response.

Publications List

The Choices for the 21st Century Education Project develops curricula for high schools and colleges on current foreign policy issues and offers workshops, institutes, and in-service programs for high school teachers. Course materials place special emphasis on the importance of educating students in their participatory role as citizens. All units incorporate the work of academics and policymakers from a range of perspectives and are classroom tested prior to publication. A new unit is published every three months during the academic year, and all units are updated regularly. For current information on new titles and revisions, call the Choices Education Project at (401) 863-3155 or visit the project on the World Wide Web at *http://www.brown.edu/Research/Choices/*.

Current Choices

- China on the World Stage: Weighing the U.S. Response (Revised Feb. 1996, 77 pages)
- Keeping the Peace in an Age of Conflict: Debating the U.S. Role (Revised Oct. 1995, 69 pages)
- U.S. Immigration Policy in an Unsettled World (Revised April 1996, 63 pages)
- U.S. Trade Policy: Competing in a Global Economy (Revised March 1996, 56 pages)
- Global Environmental Problems: Implications for U.S. Policy (Revised March 1996, 60 pages)
- Help, Handout, or Hindrance: U.S. Support for the Developing World (June 1995, 66 pages)
- Russia's Uncertain Transition: Challenges for U.S. Policy (Revised July 1996, 71 pages)
- Charting Russia's Future in the Post-Soviet Era (Revised Oct. 1995, 70 pages)
- After the Cold War: The U.S. Role in Europe's Transition (Revised Sept. 1994, 120 pages)
- The Role of the United States in a Changing World (Revised Nov. 1995, 44 pages)

Decision Points in History

- A More Perfect Union: Shaping American Government (August 1996, 100 pages)
- Crisis, Conscience, and Choices: Weimar Germany and the Rise of Hitler (Nov. 1994, 84 pages)
- Ending the War against Japan: Science, Morality, and the Atomic Bomb (July 1995, 102 pages)
- Coming to Terms with Power: U.S. Choices after World War II (Aug. 1994, second edition, 68 pages)
- In the Shadow of the Cold War: The Caribbean and Central America in U.S. Foreign Policy (Revised Sept. 1995, 111 pages)
- The Limits of Power: The United States in Vietnam (Nov. 1994, second edition, 119 pages)

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A teacher's resource book is included free with each unit ordered at regular price.
Classroom sets of student texts (15 or more of the same unit) are available at $5 per copy.

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